

Final Report of the Committee on Specifications and Tolerances

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Reference
Key Number

300 Introduction

This is the final report of the Committee on Specifications and Tolerances (S&T Committee) for the 88th Annual Meeting of the National Conference on Weights and Measures (NCWM). The report is based on the 88th Interim Report offered in NCWM Publication 16, "Committee Reports," the Addendum Sheets issued at the Annual Meeting, and actions taken by the membership at the Voting Session of the Annual Meeting.

Table A identifies the agenda items in the report by Reference Key Number, Item Title, and Page Number. The item numbers are those assigned in the Interim Meeting Agenda. Voting items are indicated with a "V," or if the item was part of the consent calendar by the suffix "VC" after the item number. Items marked with an "I" after the reference key number are information items. Items marked with a "D" after the key number are developing issues. The developing designation indicates an item that while it has merit, it may not be adequately developed for action at the national level. Developing items inform parties about issues that are developing in different localities or in the regional associations. A developing item is returned to the submitter to develop further before any action is taken at the national level. The Committee withdrew items marked with a "W." Items marked with a "W" generally will be referred to the regional weights and measures associations because they either need additional development, analysis, and input, or did not have sufficient Committee support to bring them before the NCWM. Table B lists the Appendices to the report, and Table C provides a summary of the results of the voting on the Committee's items and the report in entirety.

The attached report contains many recommendations to revise or amend National Institute of Standards and Technology (NIST) Handbook 44, 2003 Edition, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices." Proposed revisions to the handbook are shown in **bold face print** by ~~crossing out~~ text to be deleted, and underlining information to be added. Requirements that are proposed to be nonretroactive are printed in italics. Entirely new paragraphs or sections proposed for addition to the handbook are designated as such and shown in **bold face print**.

Note: The policy of the National Institute of Standards and Technology is to use metric units of measurement in all of its publications; however, recommendations received by the NCWM technical committees have been printed in this publication as they were submitted and may, therefore, contain references to inch-pound units.

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Table B
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Table C
Voting Results

Reference Key No.	House of State Representatives		House of Delegates		Results
	Yeas	Nays	Yeas	Nays	
300 (Consent Calendar)	All Yeas	No Nays	All Yeas	No Nays	Passed
310-1A	31	1	36	1	Passed
320-2	30	0	34	0	Passed
320-10A	32	0	37	0	Passed
320-10B	32	0	35	0	Passed
320-10C	32	0	34	0	Passed
330-5 (Pulled from Consent Calendar)	29	3	31	5	Passed
331-1	26	6	29	4	Returned to Committee
336-1	32	0	35	0	Passed
336-2	32	0	36	0	Passed
300 (Report in its Entirety Voice Vote)	All Yeas	No Nays	All Yeas	No Nays	Passed

Details of all Items
(In order by Reference Key Number)

310 General Code

310-1A V G-S.1. Identification; Not-Built-for-Purpose Software-Based Devices, G-S.1.1. Not Built-for-Purpose Devices; Software-Based, and Appendix D; Definition of Built-for-Purpose Device

(This item was adopted.)

(During the 2003 NCWM Annual Meeting Item 310-1 was separated into two parts, 310-1A and 310-1B, to allow a vote on the original proposal for Not-Built-for-Purpose Software-Based devices and still provide assurance that the issue of Built-for-Purpose Software-Based devices would be on the agenda next year.)

Source: Carryover Item 310-1. (This item was developed by the National Type Evaluation Technical Committee (NTETC) Measuring Sector and first appeared on the Committee's 2002 agenda.)

Recommendation: Modify NIST Handbook 44, General Code G-S.1. Identification (d) and add a new paragraph (e) as follows:

G-S.1. Identification. - All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

- (a) the name, initials, or trademark of the manufacturer or distributor;
- (b) a model designation that positively identifies the pattern or design of the device;
- (c) *the model designation shall be prefaced by the term "Model," "Type," or "Pattern." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod."*
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

[Note: Prefix lettering may be initial capitals, all capitals or all lower case.]
- (d) *except for equipment with no moving or electronic component parts and not built-for-purpose, software-based devices, a nonrepetitive serial number;*
[Nonretroactive as of January 1, 1968]
- (e) *for not built-for-purpose, software-based devices the current software version designation;*
- (f)(e) *the serial number shall be prefaced by words, an abbreviation, or a symbol that clearly identifies the number as the required serial number; and*
[Nonretroactive as of January 1, 1986]
- (g)(f) *the serial number shall be prefaced by the words "Serial Number" or an abbreviation of that term. Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No, and S No.).*
[Nonretroactive as of January 1, 2001]

~~(h)(g)~~ *For devices that have an NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number, the NTEP CC shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).*
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.
(Amended 1985, 1991, 1999 and 2000)

Add a new General Code paragraph G-S.1.1. and renumber existing paragraph G-S.1.1. as follows:

G-S.1.1. Not Built-For-Purpose Devices, Software-Based. - For not built-for-purpose, software-based devices, the following shall apply:

(a) the manufacturer or distributor and the model designation shall be continuously displayed or marked on the device (see note below), or

(b) the Certificate of Conformance (CC) Number shall be continuously displayed or marked on the device (see note below), or

(c) all required information in G-S.1. Identification. (a), (b), (c), (e), and (h) be continuously displayed. Alternatively, a clearly identified "view only" System Identification, G-S.1. Identification, or Weights and Measures Identification shall be accessible through the "Help" menu. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.

Note: Clear instructions for accessing the remaining required G-S.1. information shall be listed on the CC. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.
[Nonretroactive as of January 1, 2004]

G-S.1.1.2. Remanufactured Devices and Remanufactured Main Elements. - All remanufactured devices and remanufactured main elements shall be clearly and permanently marked for the purpose of identification with the following information:

(a) the name, initials, or trademark of the last remanufacturer or distributor;

(b) the remanufacturer's or distributor's model designation if different than the original model designation.
[Nonretroactive as of January 1, 2002]

Add a new definition to Appendix D, Definitions, for "built-for-purpose devices" as follows:

built-for-purpose device. Any main device or element which was manufactured with the intent that it be used as, or part of, a weighing or measuring device or system.

Discussion/Background: At the 2002 NCWM Interim and Annual Meetings, the S&T Committee reviewed and received comments on two proposals to address marking requirements for software based "Not Built-for-Purpose devices. One proposal was developed and submitted by the NTETC Measuring Sector. The other proposal was developed and submitted by the NTETC Weighing Sector. The Committee asked that the NTETC Measuring and Weighing Sectors review both proposals and attempt to agree on a single proposal that is acceptable to all parties.

At the Fall 2002 NTETC Sector Meetings, the Weighing Sector developed a new proposal based on both of the proposals submitted in 2001. That proposal was forwarded to the NTETC Measuring Sector for review and comment. The Measuring Sector reviewed the proposal developed by the Weighing Sector and concurred with the intent of the proposal. The Measuring Sector recommended some changes to the proposal and agreed to forward it to the NCWM S&T Committee for consideration. The Measuring Sector's modified proposal was also sent to the Weighing Sector members along with a ballot requesting approval of the modifications. The result of the ballot was 9 affirmative votes, 1 negative vote, and 3 abstentions.

At its October 2002 Annual Meeting, the Southern Weights and Measures Association (SWMA) supported the Measuring Sectors revision and encouraged both to support the proposal.

At the 2003 NCWM Interim Meeting, the Committee heard support for the proposal developed by the Measuring Sector at its October 2002 Meeting. The Committee also heard that the proposal should include "Built-for-Purpose" devices. The Committee agreed that for software-based systems the software version number has greater value than a serial number. The Committee also agreed that the word "may" should be removed from the proposed G-S.1.1. (a), (b), and (c). The Committee agreed to continue limiting the proposal to "Not Built-for-Purpose" devices and to present the item for a vote at the 2003 NCWM Annual Meeting.

At the 2003 NCWM Annual Meeting, the Committee reviewed an alternate proposal submitted by the Scale Manufacturers Association (SMA) that was intended to allow the same alternate methods for providing required identification markings for both "Built-for-Purpose" and "Not Built-for-Purpose" devices. The Committee agreed that there appeared to be no opposition to allowing the same alternate methods for providing required identification markings on "Built-for-Purpose" Software-Based Devices as those proposed for "Not Built-for-Purpose" devices. However, the Committee believed that the SMA alternate proposal to include "Built-for-Purpose" devices needed further review and development by the NTETC Weighing and Measuring Sectors and the Regional Associations prior to a vote. The Committee agreed to split the item into two parts and to present item 310-1A for a Vote and to retain Item 310-1B as an information item. The Committee modified the item title to include the words "Not Built-for-Purpose" and made some editorial changes to the proposal to clarify that the alternative methods for meeting marking requirements only apply to "Not Built-for-Purpose" devices at this time. The SMA expressed concern with the non-level playing field that would be created if the proposed alternate methods for meeting marking requirements applied only to "Not Built-for-Purpose" devices; however, splitting the item into two parts to facilitate adding similar requirements for "Built-for-Purpose Software-Based Devices" probably satisfied that concern. The Meter Manufacturers Association (MMA) and one manufacturer of retail motor-fuel dispensers supported the Committee's decision to split the items. A weights and measures official stated that inspectors should be able to easily access the software version number and adoption of this item will facilitate that access.

For more background information, refer to the 2002 S&T Final Report.

310-1B I G-S.1. Identification; Built-for-Purpose Software-Based Devices, G-S.1.1. Required Information, G-S.1.2. Location of Marking Information for Built-for-Purpose, Software-Based Devices, G-S.1.3. Required Information for Not Built-for-Purpose, Software-Based Devices, and Appendix D; Definition of Not Built-for-Purpose Device

(During the 2003 NCWM Annual Meeting Item 310-1 was separated into two parts, 310-1A and 310-1B, to allow a vote on the original proposal for Not Built-for-Purpose Software Based devices and still provide assurance that the issue of Built-for-Purpose Software-Based devices would be on the 2004 agenda.)

Discussion: See the discussion in Item 310-1A above. The Committee agreed to retain Item 310-1B as an information item as follows:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification ~~with the following information.~~ The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device. (Amended 1985, 1991, 1999 and 2000)

G-S.1.1. Required Information. – Equipment utilizing a plate or badge for identification must be permanently marked with the following information:

- (a) the name, initials, or trademark of the manufacturer or distributor;
- (b) model designation that positively identifies the pattern or design of the device;
- (c) *the model designation shall be prefaced by the term "Model," "Type," or "Pattern." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the*

word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod."

[Nonretroactive January 1, 2003]

(Added 2000) (Amended 2001)

[Note: Prefix lettering may be initial capitals, all capitals or all lower case.]

- (d) except for equipment with no moving or electronic component parts, a nonrepetitive serial number;
[Nonretroactive as of January 1, 1968]*
- (e) the serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number; and
[Nonretroactive as of January 1, 1986]*
- (f) the serial number shall be prefaced by the words "Serial Number" or an abbreviation of that term. Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No, and S No.)
[Nonretroactive as of January 1, 2001]*
- (g) For devices that have an NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number, the NTEP CC shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.)
[Nonretroactive as of January 1, 2003]*

~~The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device. (Amended 1985, 1991, 1999 and 2000)~~

G-S.1.2. Location of Marking Information for Built-for-Purpose, Software-Based Devices. – For built-for-purpose, software-based devices, with display capability, the following shall apply:

- ~~*(a) the manufacturer or distributor and the model designation be continuously displayed or marked on the device*, or*~~
- ~~*(b) the Certificate of Conformance (CC) Number be continuously displayed or marked on the device*, or*~~
- ~~*(c) all required information in G-S.1.1. Identification. (a), (b), (c), (e), and (h) be continuously displayed. Alternatively, a clearly identified System Identification, G-S.1. Identification, or Weights and Measures Identification shall be accessible through the "Help" menu. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.*~~

~~**Clear instructions for accessing the remaining required G-S.1.1. information shall be listed on the CC. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.*~~

~~*[Nonretroactive as of January 1, 200X]*~~

- (a) All information defined in G-S.1.1. shall be either marked on the unit or continuously displayed. Alternative markings are:*
 - 1. the manufacturer or distributor name and the model number, or*
 - 2. the Certificate of Conformance (CC) Number, provided that access to the remaining G-S.1.1. information is available through the "Help" key, or clear instructions are listed on the CC.*
- (b) Information necessary to identify that the software in the device is the same type that was evaluated.*

G-S.1.3. Required Information for Not Built-for-Purpose, Software Based Devices. – For not built-for-purpose, software based devices, the following shall apply:

(a) All information defined in G-S.1.1. (a), (b), (c) and (g) shall be either marked on the unit or continuously displayed. Alternative marking requirements are:

1. the manufacturer or distributor name and the model number, or

2. the Certificate of Conformance (CC) Number.

Provided that access to the remaining required G-S.1.1. information is available through the “Help” key or clear instructions are listed on the CC.

G-S.1.14. Remanufactured Devices and Remanufactured Main Elements. All remanufactured devices and remanufactured main elements shall be clearly and permanently marked for the purpose of identification with the following information:

(a) the name, initials, or trademark of the last remanufacturer or distributor;

(b) the remanufacturer's or distributor's model designation if different than the original model designation.

[Nonretroactive as of January 1, 2002]

The above proposed changes lead to the need for two new definitions. Suggestions are:

Built-for-purpose device. Any main device or element which was manufactured with the intent that it be used as, or part of, a weighing or measuring device or system.

Not built-for-purpose device. Any main device or element which was not originally manufactured with the intent that it be used as, or part of, a weighing or measuring device or system

Editor's note: The definition for “built-for-purpose” was adopted under S&T Agenda Item 310-1A G-S.1. Identification: Not-Built-for-Purpose Software-Based Devices, and Appendix D; Definitions of Built-for-Purpose Device.

For more discussion and background refer to Item 310-1A.

320 Scales

320-1 I S.1.12. Manual Gross Weight Entries and UR.3.9. Use of Manual Gross Weight Entries

Source: Carryover Item 320-4. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Modify paragraphs S.1.12. and UR.3.9. as follows:

S.1.12. Manual ~~Gross~~ Weight Entries. – A device shall accept an entry of a manual ~~gross~~ weight value only when the scale is at gross load zero and the scale ~~gross or net* weight~~ indication is at zero ~~in the gross weights display mode~~. Recorded manual weight entries except those on labels generated for packages of standard weights, shall identify the weight value as a manual weight entry by one of the following terms: “Manual Weight,” “Manual Wt,” or “MAN WT.” The use of a symbol to identify multiple manual weight entries on a single document is permitted, provided that the symbol is defined on the same page on which the manual weight entries appear and the definition of the symbol is automatically printed by the recording element as part of the document.

[Nonretroactive as of January 1, 1993]

[*Nonretroactive as of January 1, 2004.]

UR.3.9. Use of Manual ~~Gross~~ Weight Entries. – Manual ~~gross~~ weight entries are permitted for use in the following applications only: (1) on a point-of-sales system interfaced with scales when credit is given for a

weighed item on point-of-sale systems interfaced with scales, or when an item is pre-weighed and marked with the correct net weight; (2) when a device or system is generating labels for standard weight packages; (3) when postal scales or weight classifiers are generating manifests for packages to be picked up at a later time; or and (4) on livestock scale and vehicle scale systems generate weight tickets to correct erroneous tickets.

Discussion: This proposal was developed to address concerns about practices for using manual weight entries on point-of-sale (POS) systems. One national grocery company manually enters weights (obtained from a scale other than the POS system) into its POS system when an item (e.g., watermelons, turkeys, roasts, etc.) exceeds the capacity of the POS scale system or when the scanner system cannot read the Universal Product Code (UPC) on a random weight package (but the weight and price per pound are legible). These applications are not specifically addressed in NIST Handbook 44 regarding the use of manual weight entries.

Several restrictions are placed on the use of manual weight entries in Handbook 44 to deter fraudulent use of the feature and to ensure that entries are properly identified. Paragraph UR.3.9. permits use of manual weight entries in applications where a credit is given on a POS system, to generate labels for standard weight packages, for postal weight manifests when packages are picked up at a later time, or to correct erroneous tickets generated by livestock or vehicle scales. Paragraph S.1.12. permits manual weight entries only when the scale is at gross load zero and the scale indication is zero. This also specifies that manual weight entries must be identified with specific terminology on labels (except standard weight packages) or tickets. The Committee had concerns that adding more applications to the list of weighing operations, where manual entries are permitted, might not adequately recognize all weighing installations where manual weight entries are appropriate.

At the July 2002 NCWM Annual Meeting, the Committee recommended a more complete assessment of the field use of manual weight entries since not all involve gross weights. The Committee reviewed several proposals to modify paragraph UR.3.9. to address specific manual weight entry applications encountered by each submitter. The Committee agreed that the use of manual weight entries occurs with both gross and net weight packages, therefore, the proposals to modify paragraph UR.3.9., as worded, did not address all instances where manual weight entries occur. The Committee also discussed a proposal, developed by the Committee at the 2002 NCWM Interim Meeting that addressed various manual weight entries that occur nationally in weighing operations. The proposal modified paragraph S.1.12. to recognize manual weight entries for both gross and net weight packages and to require the system to identify and print manual tare entries.

The Committee agreed that changes were also necessary to paragraph UR.3.9. to ensure that the requirement is consistent with the proposed modifications to paragraph S.1.12. The Committee agreed to consider recommendations to modify paragraph UR.3.9. because corresponding changes are needed for device operators that use manual weight entries.

In September 2002, the WWMA indicated its support for a proposal to modify paragraph UR.3.9. to recognize manual weight entries on POS systems for marking the correct weight on preweighed items. The WWMA indicated that it is acceptable to manually enter weight and price information and use the POS system as a calculator. The WWMA also proposed removing all references to the term "gross" from paragraph UR.3.9. to correspond with the changes recommended for paragraph S.1.12.

During the 2003 NCWM Interim Meeting, several scale manufacturers indicated it would be too costly to require devices to print manual tare values. Scale manufacturers supported an alternate proposal to modify paragraph S.1.12. to specify that only "direct sale" devices accept manual weight entries.

The Committee was not certain that the WWMA proposal to modify paragraph UR.3.9. as written clearly identified which applications are permitted to use manual weight entries. Additionally, the Committee was not certain that the proposal permits manual weight entries for random weight packages. The Committee agreed the proposed language in paragraph S.1.12. might be misleading as to whether or not the device must print the value for each keyboard-, stored-, push-button- or digitally-entered tare. Consequently, the Committee deleted the proposed language to identify and print manual tare values on labels or recorded representation from paragraph S.1.12. The Committee also modified the proposal to clarify which type of manual weight entries are acceptable for point-of-sale systems and to clarify that the application in paragraph S.1.12. is effective on January 1, 2004, for manual net weight entries. However, the Committee considered keeping the original effective date of January 1, 1993, for simplicity since manual gross and net weight entries already occur and the proposal would make both entries acceptable. The Committee believed that these modifications afforded the flexibility grocers needed to make manual weight entries while providing sufficient safeguards to prevent fraudulent use of the feature.

The Committee acknowledges that there are specific weighing applications where manual gross weight entries are permissible. However, Handbook 44 does not include language to address every transaction that might use the manual weight entry feature and require the recorded value to be identified to prevent fraudulent use of the feature. Handbook 44 specifies that the scale must be at gross load zero and the scale indication at zero in the gross weight display so that the customer realizes that a manual weight entry is taking place.

In the early 1990s, the S&T Committee could not foresee all possible uses of manual weight entries on point-of-sale systems. The Committee believes the current requirements were not intended to prohibit manual weight entries to calculate a new price. Paragraphs S.1.12. Manual Gross Weight Entries and UR.3.9. Use of Manual Gross Weight Entries would permit a point-of-sale system interfaced with a scale to give credit for a net weighed item or when an item is pre-weighed and marked with the correct net weight.

The Committee acknowledges there is confusion about the proper operation of tare features and the specific point in the transaction where values must be identified, in part, because NIST Handbook 44 does not include definitions for the terms, “gross,” “net,” and “tare.” NIST Handbook 130 (Weights and Measures Law Section 1.10) defines “net weight” and Publication 14 addresses push-button, keyboard, programmable, digital, and stored tares. The Committee believes future work on manual weight entry requirements may require defining those terms to clarify what values are appropriate for manual weight entries.

The Committee agreed with industry’s concerns about how the proposed modification to paragraph S.1.12. may be interpreted to restrict keyboard tare entries and tare determined on vehicle weigh-in/weigh-out systems. A keyboard entry of tare prior to the entry of a manual weight value is not permitted because the proposal requires that the scale must be at zero load in order to accept a manual weight entry. The proposal would not, for example, permit entry of the tare weight of a vehicle at a recycling operation when the scale is not at a gross zero load. Therefore, the Committee changed the proposal to an information item and recommended that the Weighing Sector revise the language to clarify the original intended use of the manual weight entry feature in existing and other applications that are the result of new technology and today’s marketing practices (e.g., tier pricing).

For more background information, refer to the 2002 S&T Final Report.

320-2 V S.1.2.3. Prescription Scale with a Counting Feature, S.2.5.3. Class I and Class II Prescription Scales with a Counting Feature, Table S.6.3.b. Notes for Table S.6.3.a; Note 13, Table 3 Parameters for Accuracy Classes; Footnote 2, S.6.6. Counting Feature Minimum Piece Weight and Minimum Number of Pieces, N.1.10. Counting Feature Test, T.N.3.10. Prescription Scales with a Counting Feature, Table T.N.3.10. Maintenance and Acceptance Tolerances in Excess and in Deficiency for Count, UR.3.5. Special Designs; Footnote 5, UR.3.11. Minimum Count, and UR.3.12. Correct Stored Average Piece Weight

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA). (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee’s 2002 agenda as Developing Item 360-3, Appendix A.)

Recommendation: Add the following new paragraphs to the Scales Code to address prescription scales with a counting feature:

S.1.2.3. Prescription Scale with a Counting Feature. - A Class I or Class II prescription scale with an operational counting feature shall not calculate a piece weight or total count unless the following conditions are met:

- (a) minimum individual piece weight is greater than or equal to 3 e,
- (b) minimum sample size is greater than or equal 10 pieces

S.2.5.3. Class I and Class II Prescription Scales with a Counting Feature. - A prescription scale, Class I or Class II, shall indicate to the operator when the piece weight computation is complete by a stable display of the quantity placed on the load receiving element.

S.6.6. Counting Feature Minimum Piece Weight and Minimum Number of Pieces. - A Class I or Class II prescription scale with an operational counting feature shall be marked with the minimum piece weight and minimum number of pieces used to establish an individual piece count.

N.1.10. Counting Feature Test. – A test of the counting function shall be conducted on all Class I and Class II prescription scales having an active counting feature. The test should verify that the scale will not accept a sample with less than either the minimum sample piece count or the minimum sample weight. Counting feature accuracy should be verified at a minimum of two test loads. Verification of the count calculations shall be based upon the weight indication of the test load.

Note: Test load as used in this section refers to actual calibration test weights selected from an appropriate test weight class.

T.N.3.10. Prescription Scales with a Counting Feature. – In addition to Table 6 Maintenance Tolerances (for weight), the indicated piece count value computed by a Class I or Class II prescription scale counting feature shall comply to within the tolerances in Table T.N.3.10. Maintenance and acceptance tolerances are the same.

Table T.N.3.10. Maintenance and Acceptance Tolerances in Excess and in Deficiency for Count	
Indication of Count	Tolerance (piece count)
0 to 100	0
101 to 200	1
201 or more	0.5 %

UR.3.11. Recommended Minimum Count. - A prescription scale with an operational counting feature shall be used to count a quantity of 30 (at a minimum of 30 e) or more pieces.

UR.3.12. Correct Stored Average Piece Weight. - For prescription scales with a counting feature, the user is responsible to maintain the correct stored average piece weight; especially when a medicine is reformulated.

Modify Table S.6.3.b., Note 13; Table 3 Parameters for Accuracy Classes, Footnote 2; paragraph UR.3.5. Special Designs; and Footnote 5 to paragraph UR.3.5. as follows:

Table S.6.3.b.

13. A scale designed for a special application rather than general use shall be conspicuously marked with suitable words visible to the operator and customer restricting its use to that application, e.g., postal scale, prepack scale, weight classifier, etc. **When a scale is installed with an operational counting feature, the scale shall be marked on both the operator and customer side with the statement "The counting feature is not legal for trade," except when a prescription scale complies with sections S.1.2.3., S.2.5.3., S.6.6.*

[*Nonretroactive as of January 1, 1986]

Table 3 Parameters for Accuracy Classes

² A scale marked *For prescription weighing only* may have a verification scale division (e) not less than 0.01 g.

UR.3.5. Special Designs. - A scale designed and marked for a special application (such as a prepackaging scale or prescription scale with a counting feature) shall not be used for other than its intended purpose.⁵

⁵Prepackaging scales and prescription scales with a counting feature (and other commercial devices) used for putting up packages in advance of sale are acceptable for use in commerce if all appropriate provisions of Handbook 44 are met. Users of such devices must be alert to the legal requirements relating to the declaration of quantity on a package. Such requirements are to the effect that, on the average, the contents of the individual packages of a particular commodity comprising a lot, shipment, or delivery must contain at least the quantity declared on the label. The fact that a prepackaging scale may overregister, but within established

tolerances, and is approved for commercial service is not a legal justification for packages to contain, on the average, less than the labeled quantity.

Discussion: The WWMA proposed that the counting by weight feature on prescription scales be recognized in NIST Handbook 44. The WWMA developed a proposal based on the following input from prescription scale manufacturers: (1) there is a high level of regulatory oversight by the Food and Drug Administration to ensure that prescription drug dosages are uniform, unlike other commodities sold by count based on weight, (2) pharmacists are trained professionals in search of an accurate method to dispense pills, and (3) device technology provides greater accuracy for filling containers when counting by weight rather than by hand. The WWMA recommended this application be limited to prescription scales because of the controls in place for pill dosages and pill weight.

Past NCWM discussions about the counting feature focused on variability in the size of individual items, compliance with device performance tolerances, and the individual piece weight unit having a higher resolution than the displayed scale division (d). The initial WWMA proposal included language to eliminate labeling requirements for the counting feature on prescription scales from Table S.6.3.b Note 13 and included background information from McKesson that explored some possible sources for counting error when using the weighing function to determine count. The WWMA proposal did not include language for accuracy requirements or modify the notes section to specify test procedures. These issues and others such as the appropriate standards and influence factors must be developed to establish a means for verifying the performance of a metrological feature.

The WWMA recognized that Handbook 44 must be modified to permit a counting feature for prescription scales and further work was needed to ensure that appropriate test procedures were developed. The WWMA indicated that the counting feature was suitable only for prescription scale applications when the device and the counting feature are covered by an NTEP Certificate of Conformance. The WWMA received documents from McKesson that contained the following: (1) establishing piece weight data with reference weight, (2) expanding the reference weight data (optional algorithm for prescription scale program), (3) Recommended Characteristics for a Prescription Scale, (4) Accuracy Test for Prescription Scale Counting Feature, and (5) Two Methods for Verifying Counting Accuracy (see Appendix A for the documents provided by McKesson). The WWMA encouraged McKesson to work with parties such as NTEP, NIST, and the States to make any changes necessary to the proposed test procedures so that they adequately address Handbook 44 requirements.

The SWMA reviewed the WWMA proposal, but due to time constraints the SWMA was not able to study the corresponding documents prepared by McKesson. The SWMA concluded that the type evaluation and field test procedures developed by McKesson must include tolerances and that they need further development. The SWMA recommended the proposal move forward as an information item until all work was completed on the procedures.

The Committee agreed that WWMA proposal and supplemental prescription scale counting feature test procedures developed by McKesson (see Appendix A) were a good start at recognizing that feature. The proposed procedures were supported as metrologically sound by the Scale Manufacturers Association. However, the proposal to only modify Note 13 did not include necessary NIST Handbook 44 specifications, test procedures (influence factors, appropriate standards, etc.) for the counting feature.

During the January 2003 NCWM Interim Meeting, at the Committee's recommendation, the proposal to modify Note 13 was revised by the NCWM membership. The Committee reviewed the alternate proposal shown below to add new specifications for marking the prescription scale with its internal resolution and how the count feature must function:

S.X.X. Pharmacy Scales (Scales used in pharmacy applications). A pharmacy scale installed with an operational counting feature shall be marked with the value of the internal scale division used internally for counting purposes.

S.X.X. Pharmacy Counting Scale Divisions. A pharmacy counting scale shall not count when the scale calculated individual piece weight is less than 30 counting (internal) scale divisions.

The Committee believed that the specifications were also a good start at establishing Handbook 44 requirements for Class II prescription scale counting features. However, Note 13 still required modification because the existing Handbook 44 wording prohibited the counting feature. The Committee made the proposed specifications a voting item with the stipulation that McKesson and other prescription scale manufacturers complete their work with the weights and measures community to fully develop Handbook 44 requirements that adequately address the counting feature on Class II prescription scales, prior to the 2003 NCWM Annual Meeting.

In March 2003, in response to the Committee's request for comprehensive Handbook 44 language to address the counting feature, McKesson along with the S&T Committee and NIST developed an alternate proposal similar to the recommendation above. The recommendation further modified the WWMA's proposal that added language to Table S.6.3.b. Note 13 to recognize prescription scales covered by a Certificate of Conformance that listed a commercial counting feature.

The proposed requirements were developed to ensure that the counting feature functioned properly, did not facilitate fraud, and could be verified in the field. Only Class I or Class II scale technology has sufficient resolution to determine piece weight and use that information as the basis for computing pill count to fill prescriptions. The relationship of the scale division (d) to the verification scale division (e) is already established in paragraph S.1.2.2.1. Class I and II Scales and Dynamic Monorail Scales, where $d < e \neq 10 d$. The limits on the value of d and e were considered in the development of the requirement. There is also sufficient internal resolution in Class I and II digital scales to ensure accurate piece weight measurement when d equals e. However, internal resolution cannot be determined by the scale user or customer so this value is not part of the requirement in paragraph S.1.2.3. for verifying the accuracy of the counting feature. The proposed changes also include a modification to Table 3 Parameters for Accuracy Classes Footnote 2 to eliminate any confusion about the relationship of d and e for Class III scales used in a prescription application. Additionally, the scale should not provide an indication of count when the conditions proposed in paragraph S.1.2.3. for establishing minimum piece weight, sample weight, and piece count are not met. Class I and Class II prescription scales used commercially to establish quantity must meet a tolerance for count. Packages filled through a Class I or Class II prescription scale with a counting feature that complies with all proposed Handbook 44 requirements must also comply with all other quantity and labeling requirements.

The NIST Technical Advisors provided the following example of how paragraph S.1.2.3. Prescription Scale with a Counting Feature would apply in the selection and use of a prescription scale. This example is based on a Class II prescription scale with a capacity of 500 g, $e = 0.01$ g; $d = 0.001$ g; and $n_{\max} = 50\,000$, where the prescription scale does not calculate a piece weight or total count unless all requirements in subparagraphs (a) and (b) are met as follows:

- (a) the minimum pill weight must be greater than or equal to 0.03 g (30 mg), and
- (b) the minimum number of pieces in a sample used to establish a piece weight count must be greater than or equal to 10 pills, in this case the equivalent of 0.3 g (30 mg).

A field examination procedure based on the proposed Handbook 44 requirements was needed for weights and measures officials. The new test procedure drafted and proposed for inclusion in Examination Procedure Outline Number 1, Retail Computing Scales is as follows:

14. Test count feature for Class II prescription scales. Verify the count accuracy for at least two points.

- a. Place a load equivalent to 29 e on the load receiving element and enter a sample count of 10. The device should not accept the entry.
- b. Place a load equivalent to 30 e on the load receiving element and enter a sample count of 9. The device should not accept the entry.
- c. Place a load equivalent to 30 e on the load receiving element and enter a sample count of 10. The device should accept the entry. Then place a load equivalent to 300e on the load receiving element. Verify that the total count of 100 is accurate.
- d. Place a load equivalent to 200 e on the load receiving element and enter a sample count of 10. The device should accept the entry. Then place a load equivalent to 4 000 e on the load receiving element. Verify that the total count of 200 is accurate.

The Committee also asked for input from the Food and Drug Administration, U.S. Pharmacopeia, and representatives from the pharmaceutical industry on the proposal. One scale manufacturer indicated some concern about the variability in the pill formulation process and the effect on individual pill weight.

The Committee believes that Class I and Class II prescription scales will meet all proposed specifications and tolerances for weighing and counting applications when field test standards are used to conduct accuracy tests. The Committee

questioned whether or not tests using pharmaceuticals will result in inaccuracies in the counting feature because of the effects of environmental factors on individual pill weight. Consequently, the Committee included a note in proposed paragraph N.1.10. to specify that tests shall be performed with appropriate test standards.

The Committee acknowledged that the limits on minimum individual piece weight and sample size result in a calculated minimum sample weight of 30 e and not 20 e that appears in Publication 16. The Committee reworked the proposal to eliminate from paragraph S.1.2.3. any reference to a minimum sample weight and to include the correct test load in the field test procedure used to verify the count feature. Additionally, the Committee believes the scale count feature should operate at a required rather than recommended minimum count of 30 or more pieces.

The Committee agreed that the proposal should clarify when special application marking requirements are not required on scales equipped with the counting feature. The Committee modified Table S.6.3.b. Note 13 to include an exception to the marking requirements when a prescription scale meets the operating, indicating, and marking requirements proposed in paragraphs S.1.2.3., S.2.5.3., and S.6.6.

The Committee agreed with a CWMA recommendation that the proposal should include an additional user requirement to ensure that the pill count is based on up-to-date information from the manufacturer when medicines are reformulated. The Committee modified the proposal to include a new paragraph UR.3.12. Correct Stored Average Piece Weight.

320-3 I S.6.4. Railway Track Scales

Source: Central Weights and Measures Association (CWMA)

Recommendation: Modify paragraph S.6.4. in the Scales Code as follows:

S.6.4. Railway Track Scales. - A railway track scale shall be marked with the maximum capacity of each section of the load-receiving element of the scale. Such marking shall be accurately and conspicuously presented on, or adjacent to, the identification or nomenclature plate that is attached to the indicating element of the scale. ~~The nominal capacity of a scale with more than two sections shall not exceed twice its rated section capacity. The nominal capacity of a two-section scale shall not exceed its rated section capacity*.~~ The marked nominal capacity shall not exceed the sectional capacity (SC) multiplied by the number of sections (N) of the scale minus 0.5 sections. The formula is stated as $Nominal\ Capacity \# SC \times (N - 0.5)^*$.
[*Nonretroactive as of January 1, 20024]

Discussion: In 2001, paragraph S.6.4. was modified to specify that the maximum nominal capacity for railway track scales with more than two sections must not exceed twice the marked section capacity and the nominal capacity for railway track scales with two sections must not exceed the marked section capacity. The CWMA found that the marked nominal capacity required in paragraph S.6.4. is exceeded on modular railway track scales when railcars are pushed and placed on the scale for weighing. Weighing systems monitor and record all weighments, which includes all instances where loads exceed the marked nominal capacity (except when total platform load is in excess of 105 % of scale capacity). The CWMA proposed changes to the language to permit a greater nominal capacity that is based on the section capacity multiplied by the number of sections minus 0.5 sections; the CWMA believes this change is consistent with the nominal capacity specifications for vehicle scales.

One scale manufacturer indicated that railway track scales are designed to meet American Railway Engineering Maintenance of Way Association and Cooper E-80 specifications as specified by the servicing railroad. System Associates, Inc. reported that modular railway track scales based on Cooper E-80 specifications can withstand loads far greater than the marked nominal capacity limits in existing paragraph S.6.4. The length of scales fabricated from multiple modules is restricted because of nominal capacity limitations specified in current paragraph S.6.4.

The company provided the examples below to demonstrate railway track scale loading, where railcar loads exceed nominal scale capacity limits specified in paragraph S.6.4. The modular railway track scale typically uses 100 000 lb load cells and has a 170 000 lb section capacity. A change to load cell capacity to meet the weight of coupled railcars might require modifications to the scale design and require re-evaluation by NTEP. Railcars are uncoupled at both ends to obtain a true net weight and ensure there is no coupler interaction or weight transfer. The terms used in Examples A through C that are not in Handbook 44 are defined below:

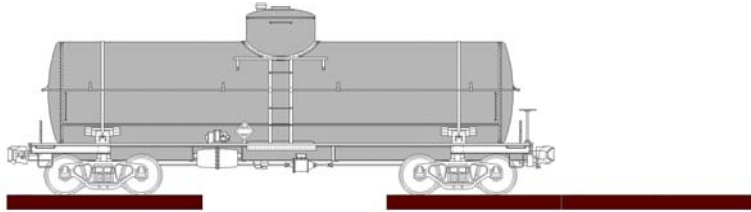
single scale – A single module having a 12 ft span that is designed to support three 80 000 lb axles on five foot centers.

double scale – A single module having a 25 ft to 26 ft span that is designed to support four 80 000 lb axles on five foot centers.

truck – A swiveling framework of wheels located at each end of the railcar.

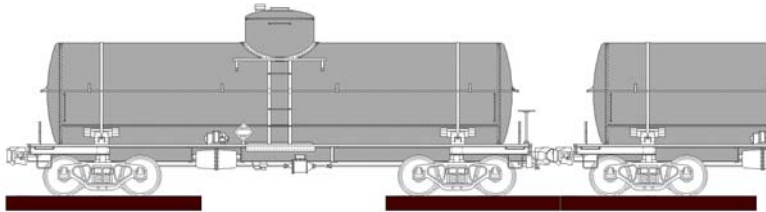
Examples of Railway Track Scale Loading

A - Short Railcar on a Single-Double Scale



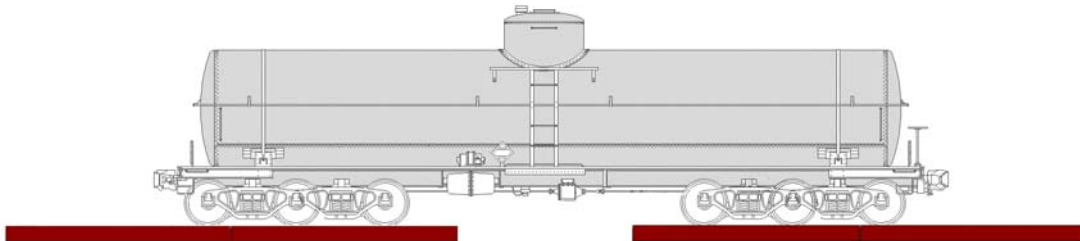
- A short railcar is spotted or placed into position for weighing on a single-double combination scale
- Each truck weighs 131 500 lb for a gross railcar weight of 263 000 lb
- The gross railcar weight does not exceed the nominal capacity of 340 000 lb

Short Railcar on a Single-Double Scale Where Weighing is NOT Intended



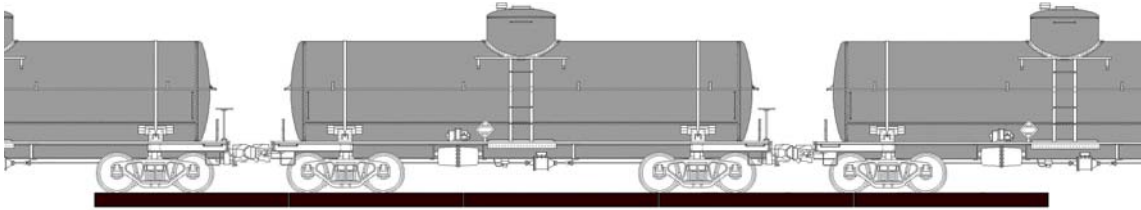
- The next car recouples to push the weighed railcar off the scale
- Each of the three trucks weighs 131 500 lb for a gross weight of 394 500 lb
- With a 340 000 lb nominal capacity, the scale is 54 500 lb overloaded under normal traffic
- The design load capacity (per railroad requirements) of this scale is 560 000 lb
- A nominal capacity of 400 000 lb would be acceptable in most applications

B - Six Axle Car on a Double-Double Scale



- Six axle railcar is spotted for weighing on a double-double combination scale
- Each truck weighs 192 000 lb for a gross weight of 384 000 lb
- With a 340 000 lb nominal capacity, this scale is overloaded by 44 000 lb
- The design load capacity of this scale (per railroad requirements) is 640 000 lb
- A nominal capacity of 600 000 lb would be acceptable in most applications

C - Railcars Moving on a 93-ft Modular Scale Where Weighing is NOT Intended



- Railcars are moving across a 93 foot scale with seven 12 foot modules
- Each truck weighs 131 500 lb for a gross weight of 526 000 lb
- With a 340 000 lb nominal capacity, this scale is overloaded by 186 000 lb
- The design load capacity of this scale (per railroad requirements) is 1 044 000 lb
- A nominal capacity of 600 000 lb would be acceptable in most applications

The Committee included text in the title of the diagrams above to clarify that the illustrations do not represent the weighing of coupled railcars. The diagrams show movement of multiple coupled railcars across scale modules to position the railcars for weighing. The scale indication may blank out since the combined weight of the coupled cars exceeds the scale's rated nominal capacity, but the indication operates when the railcars are uncoupled for the weighing of a single railcar.

The Committee acknowledged that overloading of scales does occur, for example, when locomotives are driven across scales. However, the overloading of scales is not a problem for scales that are designed to withstand the loads, provided the scale complies with NIST Handbook 44 specification that a scale cannot indicate more than 105 % of scale capacity. Additionally, the scale should be suitable for a particular use with respect to its design, which includes but is not limited to its weighing capacity.

In response to a request from the submitter, the Committee made changes to the formula to align the relationship of the equations in the formula with similar applications elsewhere in Handbook 44. The Committee modified the proposed formula to require a nominal capacity that is less than or equal to the section capacity multiplied by the number of scale sections minus 0.5 sections. The Committee also heard that there may be instances where coupled railway cars are being statically weighed and believes that a user requirement may be needed to resolve this enforcement issue.

The Committee agreed that the proposed formula permits nominal capacities that may exceed the safe load of a railway track scale. Typically, weights and measures jurisdictions do not have sufficient field test standards to test railway track scales that exceed a 640 000 lb nominal capacity at the minimum 12.5 % (80 000 lb) of capacity prescribed in Table 4 Minimum Test Weights and Test Loads.

The Committee believes that the item needs further review by industry and the Weighing Sector to either modify the proposed formula or develop additional language that establishes appropriate capacity limitations for railway track scales. Consequently, the Committee changed the proposal to an information item to allow sufficient time for input on appropriate nominal capacity limitations.

320-4 I Appendix D; Definition of Counter Scale

Source: National Type Evaluation Technical Committee (NTETC) Weighing Sector

Recommendation: Modify the definition of "counter scale" as follows:

counter scale. ~~One-A scale~~ that, by reason of its size, arrangement of parts, and ~~moderate with a~~ nominal capacity no greater than 100 kg (220 lb), is adapted for use on a counter or bench. Sometimes called "bench scale." [2.20]

Discussion: There are some questions regarding whether certain scales are classified as bench/counter scales or classifying them as floor scales. This confusion has led officials to perform different shift tests on the same device. In some instances, the shift tests were based on the requirements in NIST Handbook 44 paragraph N.1.3.1. Bench or Counter Scales, which describes test load positions for bench/counter scales. In other instances, the tests were based on

paragraph N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers which addresses test load positions for other (platform) scales, and were applied to the same device model when it was classified as a floor scale.

Currently, Handbook 44 requires that bench/counter scale shift tests be conducted with a half-capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element (see paragraph N.1.3.1.). Shift tests on other types of platform scales are conducted with a one-half capacity test load centered, as nearly as possible, successively at the center of each quadrant (see paragraph N.1.3.8.). Several manufacturers have indicated that it is an unfair test to place one-quarter scale capacity on the corners of a single load cell scale as compared to placing one-quarter scale capacity in the corners of a scale with four load supports.

NIST Handbook 44 also prescribes different requirements for the maximum loads that can be rezeroed in paragraph S.2.1.3. Scales Equipped with an Automatic Zero-Setting Mechanism for bench/counter scales (0.6 scale division) and for all other scales (1.0 scale division).

In October 2002, the NTETC Weighing Sector recommended a proposal to modify paragraphs N.1.3.1. and N.1.3.8. and to revise the current definition of “counter scale” to distinguish bench/counter scales from floor scales based on the number of platform supports and the device’s nominal capacity rating. The Weighing Sector recommended a capacity limit of 100 kg (220 lb) for bench/counter scales since many shipping scales in commercial use on business counters or elevated conveyors have a nominal capacity of 100 lb to 200 lb and 100 kg (220 lb) is consistent with capacity limits set by Measurement Canada.

During its October 2002 Annual Meeting, the Southern Weights and Measures Association (SWMA) agreed with limiting the capacity of a bench scale to 100 kg (220 lb); but the SWMA did not agree with the proposed changes to paragraphs N.1.3.1. and N.1.3.8.

In April 2003, the Scale Manufacturers Association (SMA) supported the recommendation to modify the definition of “counter scale” if it helps in determining an appropriate shift test procedure. However, the SMA could support only limited changes to paragraphs N.1.3.1. and N.1.3.8. to specify the conditions for shift tests on multiple platform supports of bench and counter scales and test loads placed on multiple points for all other scales with a single platform support.

During the 2003 NCWM Annual Meeting, the Committee agreed to continue supporting several points reached at the January 2003 Interim Meeting. The Committee recognized that the Weighing Sector’s proposal was intended to align the U.S. and Measurement Canada’s shift test procedure that are based on the number of load supports in the scale. The Committee agreed with comments from industry and weights and measures officials that paragraphs N.1.3.1. and N.1.3.8. already adequately address shift test procedures and any change would create confusion. The Committee agreed with comments recommending that the definition of counter scale needs to be modified. However, the Committee decided to amend the definition for clarity only and to include a 100 kg limit on the nominal capacity of a counter scale.

The Committee agreed that the proposal to modify the definition of counter scale as written does not provide weights and measures officials with a means to determine the shift test procedure that is appropriate for a scale design (single or four load supports). The Committee recognized the difficulty or reluctance of field officials to dismantle a scale to determine its design. Consequently, the Committee changed this item’s status to an information item and recommended that the Weighing Sector consider the practice of including scale design information on all NTEP Certificates of Conformance to assist officials in performing shift tests.

320-5 VC N.1.3.4. Vehicle Scales, Axle-Load Scales, and Livestock Scales, N.1.3.4.1. Vehicle Scales, Axle-Load Scales, and Combination Vehicle/Livestock Scales, N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales and Combination Vehicle/Livestock Scales With More Than Two Sections and N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers

(This item was adopted.)

Source: Carryover Item 320-1B. (This item originated from the National Type Evaluation Technical Committee (NTETC) Weighing Sector and first appeared on the Committee’s Agenda in 2001 as Item 320-4.)

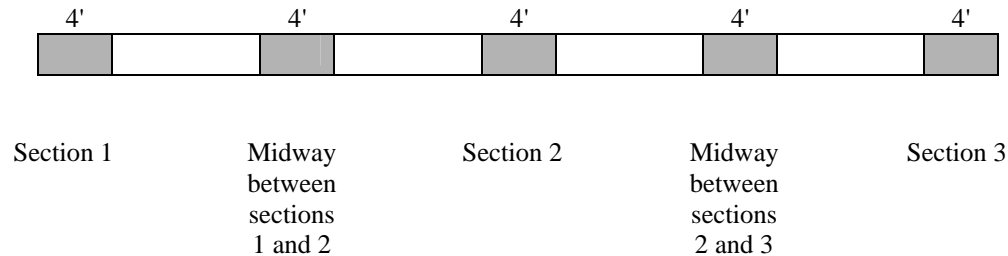
Recommendation: Modify paragraphs N.1.3.4. and N.1.3.4.1. as follows:

N.1.3.4. Vehicle Scales, Axle-Load Scales, and Livestock Scales

N.1.3.4.1. Vehicle Scales, Axle-Load Scales, and Combination Vehicle/Livestock Scales –

(a) Minimum Shift Test. At least one shift test shall be conducted with a minimum test load of 12.5 % of scale capacity and may be performed anywhere on the load-receiving element using the prescribed test patterns and maximum test loads specified below. ~~(Two section livestock scales shall be tested consistent with N.1.3.8.)~~ **(Combination Vehicle/Livestock scales shall also be tested consistent with N.1.3.4.2.)**

(ab**) Prescribed Test Pattern and Loading for Vehicle Scales, Axle-Load Scales, and Combination Vehicle/Livestock Scales.** The normal prescribed test pattern shall be an area of 1.2 m (4 ft) in length and 3.0 m (10 ft) in width or the width of the scale platform, whichever is less. Multiple test patterns may be utilized when loaded in accordance with Paragraph (b) **(c), (d), or (e) as applicable.**



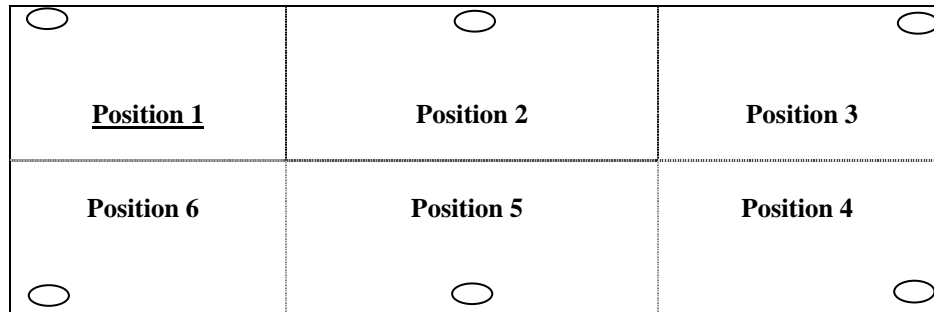
(bc**) Maximum Loading Precautions for Vehicle Scales, Axle-Load Scales, and Combination Vehicle/Livestock Scales.** When loading the scale for testing, one side of the test pattern shall be loaded to no more than half of the concentrated load capacity or test load before loading the other side. The area covered by the test load may be less than 1.2 m (4 ft) x 3.0 m (10 ft) or the width of the scale platform whichever is less; for test patterns less than 1.2 m (4 ft) in length the maximum loading shall meet the formula: [(wheel base of test cart or length of test load divided by 48 in) x 0.9 x CLC]. The maximum test load applied to each test pattern shall not exceed the concentrated load capacity of the scale. When the test pattern exceeds 1.2 m (4 ft), the maximum test load applied shall not exceed the concentrated load capacity times the largest “r” factor in Table UR.3.2.1. for the length of the area covered by the test load. For weighing elements installed prior to January 1, 1989, the rated section capacity may be substituted for concentrated load capacity to determine maximum loading. An example of a possible test pattern is shown ~~below~~ above.

(ed**) Multiple Pattern Loading.** To test the nominal capacity, multiple patterns may be simultaneously loaded in a manner consistent with the method of use.

(ee**) Other Designs.** Special design scales and those that are wider than 3.7 m (12 ft) shall be tested in a manner consistent with the method of use but following the principles described above.

Add a new paragraph N.1.3.4.2. and associated diagram as follows:

N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. - A minimum test load of 5000 kg (10 000 lb) or one-half of the rated section capacity, whichever is less, shall be placed, as nearly as possible, successively over each main load support as shown in the diagram below. For livestock scales manufactured between January 1, 1989, and January 1, 2003, the required loading shall be no greater than one-half CLC. (Two-section livestock scales shall be tested consistent with N.1.3.8.)

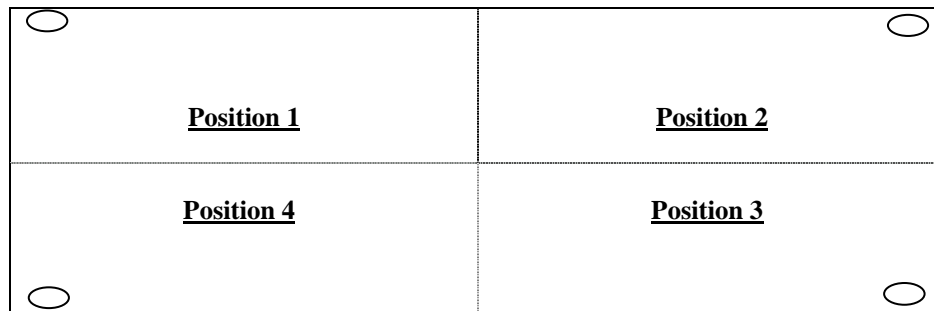


○ = Load Bearing Point

Modify paragraph N.1.3.8. as follows:

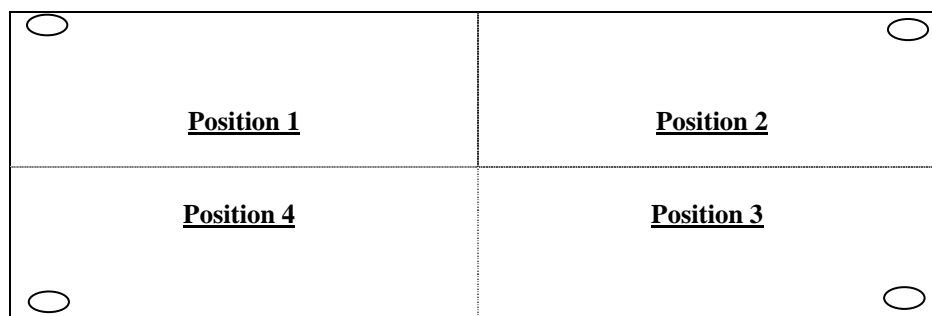
N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. – A shift test shall be conducted using the following prescribed test loads and test patterns. with a half capacity test load centered, as nearly as possible, successively at the center of each quarter of the load receiving element, or with a quarter capacity test load centered, as nearly as possible, successively over each main load support. For livestock scales the shift test load shall not exceed one-half the rated section capacity.

- (a) A shift test load shall be conducted using a one-quarter nominal capacity test load centered as nearly as possible, successively over each main load support as shown in the diagram below, or



○ = Load Bearing Point

- (b) A shift test load shall be conducted using a one-half nominal capacity test load centered as nearly as possible, successively at the center of each quarter of the load-receiving element as shown in the diagram below.**



○ = Load Bearing Point

Modify Table S.6.3.a. Marking Requirements Note 22 as follows:

- 22. Combination vehicle/livestock scales must be marked with both the CLC for vehicle weighing and the section capacity for livestock weighing. All other requirements relative to these markings will apply.
[Nonretroactive as of January 1, 2003.]***

Note: The marked section capacity for livestock weighing may be less than the marked CLC for vehicle weighing.

Discussion: In 2001, the Committee considered language that prescribed the appropriate test load patterns, the maximum test load, and capacity ratings for safe and adequate performance tests of vehicle and livestock scales. The 2001 proposal also included language to modify the definition of Concentrated Load Capacity (CLC) to remove any reference to livestock scales. In response to comments from industry, weights and measures officials, and Grain Inspection, Packers and Stockyards Administration (GIPSA), the 2001 proposal was referred back to the Weighing Sector for further work to clarify what weighing devices the requirements apply to and the positions of the test load.

In 2002, the Committee agreed to a modified Weighing Sector proposal that places in NIST Handbook 44 the shift tests and test load patterns currently in use when testing livestock and vehicle scales. The 2002 proposal did not receive the majority vote necessary to modify requirements in Handbook 44. The proposal was returned to the Committee. The Committee separated the proposal (Item 320-1B) into two parts, after the 2002 NCWM Annual Meeting to facilitate review of the issues. The proposal to modify the definition of CLC to eliminate any reference to livestock scales now appears as agenda Item 320-9.

At its 2002 Interim Meeting, the Northeastern Weights and Measures Association recommended that the proposal remain an information item to allow sufficient time to address any concerns expressed by the Scale Manufacturers Association (SMA).

The SMA supported the proposal to add new paragraph N.1.3.4.2. and modify Table S.6.3.b. Note 22 shown in the recommendation above.

At its 2002 meeting, the Weighing Sector agreed to submit a separate proposal to make the definition for CLC a separate agenda item (see Item 320-9) from the agenda item which establishes test patterns and test loads for livestock scales. The Weighing Sector agreed with the Central Weights and Measures Association recommendation that a test load of 12.5 % of scale capacity, not to exceed one-half section capacity, is more than adequate to test a main load support. The Sector noted that the test load of 12.5 % of scale capacity provides an adequate test of the performance of the load support and also addresses safety concerns that might arise when stacking weights. The Weighing Sector proposed alternate language for new paragraph N.1.3.4.2. and included the diagram shown above that specifies a minimum test load of 10 000 lb to facilitate the safe application of test weights while applying a load that more closely simulates the potential

concentration of livestock in the corner of the scale. The language in the Weighing Sector proposal permits weights and measures officials and NTEP laboratories to conduct shift tests with a minimum load of 12.5 % of scale capacity.

The Weighing Sector believed that testing of main load supports more accurately reflects the actual usage of livestock scales. The Weighing Sector added broken lines to the test pattern diagram in paragraph N.1.3.4.2. to indicate that test loads should not be centered over the main load bearing points.

The Committee believes the recommendations above included language that addresses the test load patterns, the maximum test load, and capacity ratings for the safe and adequate test of a device's performance in vehicle and livestock scale applications. The Committee decided that the Weighing Sector's proposal for new paragraph N.1.3.4.2. and associated diagram shown above were more appropriate guidelines for the test load and test pattern for livestock scales with more than two sections and combination vehicle/livestock scales. The Committee also agreed with the WWMA's recommendation to add a note to Table S.6.3.a. Note 22 as shown above.

The Committee discussed that there is some confusion about the terms test load and test weight; however, the proposal is technically correct and was not intended to resolve issues over those terms. After making editorial changes to include the word "scale" with each application for consistency with other related requirements in the Handbook 44 Scales Code, the Committee recommended this item for a vote.

For additional background on this item, refer to the 2001 and 2002 S&T Final Reports.

320-6 W N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers, T.N.3.4. Crane and Hopper (Other than Grain Hopper) Scales, Table 3 Parameters for Accuracy Classes; Footnote 3, Table 7a. Typical Class or Type of Device for Weighing Operations, Table 7b. Applicable to Devices not Marked with a Class Designation, and Appendix D; Definitions of Crane Scale and Hanging Scale

(This item was withdrawn.)

Source: National Type Evaluation Technical Committee (NTETC) Weighing Sector

Discussion: The Committee considered a proposal to modify paragraphs N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers and T.N.3.4. Crane and Hopper (Other than Grain Hopper) Scales, Table 3 Parameters for Accuracy Classes Footnote 3, Table 7a. Typical Class or Type of Device for Weighing Operations, and Table 7b. Applicable to Devices not Marked with a Class Designation as follows:

N.1.3.8. All Other Scales Except ~~Crane Scales~~, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. – A shift test shall be conducted with a half-capacity test load centered, as nearly as possible, successively at the center of each quarter of the load-receiving element, or with a quarter-capacity test load centered, as nearly as possible, successively over each main load support.

T.N.3.4. ~~Crane~~ Class III L Hanging and Hopper (Other than Grain Hopper) Scales. – The maintenance and acceptance tolerances shall be as specified in T.N.3.1. and T.N.3.2. for Class III L, except that the tolerance for ~~erane~~ Class III L hanging and construction materials hopper scales shall not be less than 1d or 0.1 % of the scale capacity, whichever is less.

³ The value of a scale division for ~~erane~~ Class III L hanging and hopper (other than grain hopper) scales shall be not less than 0.2 kg (0.5 lb). The minimum number of scale divisions shall be not less than 1 000.

Table 7a. Typical Class or Type of Device for Weighing Operations	
Class	Weighing Application or Scale Type
I	Precision laboratory weighing
II	Laboratory weighing, precious metals and gem weighing, grain test scales
III	All commercial weighing not otherwise specified, grain test scales, retail precious metals and semi-precious gem weighing, animal scales, postal scales, scales used to determine laundry charges, <u>hanging</u> , and vehicle on-board weighing systems
III L	Vehicle, axle-load, livestock, railway track scales, crane <u>hanging</u> , hopper (other than grain hopper) scales, and vehicle on-board weighing systems
III	Wheel-load weighers and portable axle-load weighers used for highway weight enforcement
Note: A scale with a higher accuracy class than that specified as “typical” may be used.	

Table 7b. Applicable to Devices not Marked with a Class Designation	
Scale Type or Design	Maximum Value of d
Retail Food Scales, 50-lb capacity and less than or equal to 50 lb	1 ounce
Animal Scales	1 pound
Grain Hopper Scales	
Capacity up to and incl. 50 000 lb	10 pounds (not greater than 0.05 % of capacity)
Capacity over 50 000 lb	20 pounds
Crane Hanging Scales – Capacity 5000 lb and over	not greater than 0.2 % of capacity
Vehicle and Axle-Load Scales Used in Combination	
Capacity up to and including 200 000 lb	20 pounds
Capacity over 200 000 lb	50 pounds
Railway Track Scales	
With weighbeams	20 pounds
Automatic indicating	100 pounds
Scales with capacities greater than 500 lb except otherwise specified	0.1 % capacity (but not greater than 50 lb)
Wheel-Load Weighers	0.25 % capacity (but not greater than 50 lb)
Note: For scales not specified in this table, G-UR.1.1. and UR.1. apply.	

Delete the Appendix D; Definition of Crane Scale as follows:

~~crane scale. One with a nominal capacity of 5000 pounds or more designed to weigh loads while they are suspended freely from an overhead, track mounted crane.~~

Add the following new definition of “hanging scale” to Appendix D as follows:

hanging scale. A scale designed to weigh loads while they are suspended from a hook on the scale or loads resting on a platter or platform that is suspended from the scale. Hanging scales may be any capacity and may be Class III or III L, whichever is appropriate for the intended use, as long as all parameters for the intended class are met. Sometimes called “crane scale.”

The Weighing Sector reported that existing criteria for distinguishing hanging scale applications from crane scale applications are not clear and are inconsistent. Currently, the term “hanging scale” is not defined in NIST Handbook 44 although the term is cited in several requirements in the Scales Code.

The Weighing Sector noted that Handbook 44 Scales Code Table 3 Parameters for Accuracy Classes, Footnote 3 specifies that the minimum permissible capacity for a crane scale is 500 lb; however, the existing Handbook 44 definition states that a crane scale has a nominal capacity of 5000 lb or more. The Weighing Sector also noted that there are inconsistencies in the use of the term “crane scale” in Handbook 44 and in NTEP Certificates of Conformance (CC). Several CCs were issued to families of electronic scales with capacities that range from 1 000 lb to 50 000 lb, where the scales are designated as both “hanging scales” and “crane scales.”

The Weighing Sector agreed that the only difference in the installation of hanging scales and crane scales appears to be that hanging scales are suspended from fixed supports while crane scales are suspended from overhead. However, some overhead, track-mounted scales might easily be suspended from other types of supporting structures. The Weighing Sector believed that the design of a scale’s support structure (overhead crane, fixed support, etc.) should not be the factor that determines device type.

The Southern Weights and Measures Association recommended further study on how the proposals will impact existing devices.

The Scale Manufacturers Association supported reducing the number of categories of weighing devices, but opposed removing the term crane scale from the Scales Code without further discussion.

- The Committee discussed the Weighing Sector’s concern about the large list of terms used to identify various scale types and design. The Committee questioned the existence of Class II hanging scales that may not be included in the proposed definition for “hanging scale.” The Committee believes that the Weighing Sector should explore other options to consolidate the terminology used to describe scale types and designs. In addition to examining these issues, the Committee recommends the Weighing Sector examine how devices are designated internationally. The Committee has not heard unanimous support for the proposal from parties affected by the changes. The Committee agreed that the current terminology has not created any situations that require an immediate change to Handbook 44. Given this is not an urgent issue and there is lack of support for the proposal the Committee withdrew the item from its agenda.

320-7 VC T.N.8.3.1.(a) Power Supply, Voltage and Frequency

(This item was adopted.)

Source: National Type Evaluation Technical Committee (NTETC) Weighing Sector

Recommendation: Amend T.N.8.3.1.(a) Power Supply, Voltage and Frequency as follows:

- (a) Weighing devices that operate using alternating current must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive, over the nominal line voltage with the tolerance –15 % to +10 % of the nominal, or the range as marked by the manufacturer. (Range takes precedence) of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to at 60.5 Hz.**

Discussion: NTEP Participating Laboratories reported an increase in the number of devices submitted for type evaluation with voltage ranges wider than the voltages listed in NIST Handbook 44 paragraph T.N.8.3.1. For example, a device might be marked with a voltage range of 80 V to 170 V. The Participating Laboratories believe that testing over the entire voltage range is not supported by language in paragraph T.N.8.3.1.

The NTETC Weighing Sector reviewed the Canadian and OIML requirements for maximum and minimum specified voltage. In the Canadian requirements, devices may be marked with a nominal voltage of 117 V, 225 V, or other voltage. When a device is marked with a voltage range the midpoint is taken as the nominal voltage. The device is tested at –15 % and +10 % of the marked nominal voltage. Devices marked with a range are tested to the greater of –15 % and +10 % of the midpoint of the nominal voltage or the maximum and minimum indicated voltage range values. OIML Recommendation 76-1, Nonautomatic Weighing Instruments, Part 1: Metrological and Technical Requirements - Tests (Edition 1992 E) requires testing the device at +10 % of the maximum marked voltage and –15 % of the minimum marked voltage.

The Weighing Sector's proposal to modify paragraph T.N.8.3.1.(a) required tests over the marked voltage range rather than a specified voltage range. Performance tests would be conducted at the device's marked maximum voltage, marked minimum voltage, and nominal voltage (voltage value at the midpoint of the range).

The Weighing Sector also questioned whether performance tests should be conducted during variations in frequency are appropriate. Currently, NTEP does not test for a change in line frequency of ∇ 0.5 Hz because test equipment is very expensive. Manufacturers indicated that today's weighing devices are capable of performing over a much larger voltage and frequency range than specified in Handbook 44 because devices are equipped with one version of power supply that is suitable for the worldwide marketplace.

The SWMA believes its proposed alternate language provides a requirement that harmonizes with OIML requirements.

The Committee reviewed the following alternate proposals to modify paragraph T.N.8.3.1.(a) submitted by the Weighing Sector and Southern Weights and Measures Association (SWMA), respectively.

T.N.8.3.1.(a) Power Supply, Voltage and Frequency.

- (a) Weighing devices that operate using alternating current must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive, over the line voltage range as marked of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to at 60.5 Hz.

or

T.N.8.3.1. Power Supply, Voltage and Frequency.

- (a) Weighing devices that operate from a main power supply must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive if the power supply varies in voltage from - 15 % to + 10 % of the value marked on the device. If a range of voltage is marked, the device shall operate within the conditions defined in paragraphs T.N.3. through T.N. 7., inclusive at a voltage of + 10 % of the maximum voltage marked on the device and at a voltage of -15 % of the minimum voltage marked on the device ~~using alternating current must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive, over the line voltage range of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to 60.5 Hz.~~

After reviewing the alternate proposals, the Committee agreed to modify an alternate SMA proposal to include test at 60 Hz. as shown in the recommendation. The Committee felt the end result was a requirement that provided the clearest guidelines on the voltage and frequency for a performance test.

The Committee recommended that all corresponding power supply, voltage and frequency requirements in other code sections be reviewed for clarity and consistency with the proposed language in paragraph T.N.8.3.1.(a).

320-8 W UR.1.6. Average Net Load; Class III Scales

(This item was withdrawn.)

Source: Carryover Item 320-3. (This item originated in the Central Weights and Measures Association (CWMA) and first appeared on the Committee's 2002 agenda.)

Background/Discussion: The Committee considered a proposal to add new paragraph UR.1.6. Average Net Load - Class III Scales and Table as follows:

UR.1.6. Average Net Load – Class III Scales. – To be suitable for its application, a Class III scale shall have a division such that the requirements of the following table are satisfied for the minimum and average loads weighed on the scale.

<i>Range of Scale Capacities</i>	<i>Average Net Load *</i>
<i>Capacities up to and including 1000 kg (2500 lb)</i>	<i>Average net load $\geq 100d$</i>
<i>Capacities greater than 1000 kg (2500 lb)</i>	<i>Average net load $\geq 500d$</i>

[Nonretroactive as of January 1, 2003]

** See Table 8 for recommended minimum load.*

Device suitability for particular commercial applications is a recurrent issue on the S&T Agenda and generates many questions in the weights and measures community. The proposal was intended to incorporate guidelines into NIST Handbook 44 requirements to assist business owners in the purchase of suitable equipment and to provide industry and weights and measures officials with a uniform method for assessing the suitability of a device for an application. The Committee discussed factors such as the size of the purchase (weight load), the size of the scale division, and the commodity price and how these factors affect the magnitude of the weighing error.

In 1992, the Committee considered a proposal from the CWMA to express the suitability requirements for scales as two separate formulas. Scales marked with an accuracy class would have been required to satisfy a formula for the minimum net load and a formula for the average net load. Scales not marked with an accuracy class would have had to comply with Table 7b which specifies a maximum value of d for a particular scale type or design. The scale division value was dependent on the scale capacity. The value of d for scales with capacities from 5 lb to 2500 lb, inclusive, were allowed to be a larger percentage of the minimum net load and average net load than scales with capacities less than 5 lb and greater than 2500 lb.

In 1994, the NCWM adopted guidelines to determine the average net load of purchases on Class III scales. The average net load information was used to evaluate the suitability of a scale for an application. However, the guidelines were not included in NIST Handbook 44 requirements, hence weights and measures officials find it difficult to enforce suitability requirements. Inconsistencies in the determination of a minimum load requirement for a device continue to be a concern to industry and weights and measures officials.

Regional weights and measures associations agreed that better criteria are needed to determine the suitability of a device. Several regional associations recommended that the proposal be made a developing item to allow time to develop appropriate criteria.

During its 2002 Interim Meeting, the CWMA reiterated its belief that weights and measures can obtain information about average net loads from the retailer. In instances where the retailer and weights and measures officials do not agree on the average net load, the burden of proof lies with the retailer. The CWMA also provided the following list of examples submitted by Nebraska which demonstrate how to determine the suitability of Class III scales used in specific applications.

CWMA Suitability Examples for Average Net Load (ANL)			
d – scale division			
*NIST Handbook 44 specifies scale division “d” must be expressed in units of 1, 2, or 5			
	Typical Application	Example	Formula*
1	Supermarket Checkstand	<ul style="list-style-type: none"> Most transactions involve produce that weighs from 0.5 lb to 5 lb, with infrequent weighments above and below that range The average net load is approximately 2 lb Using the formula for a scale with a capacity up to 2500 lb: A division of 0.02 lb or less is suitable 	$d \leq 1 \% \times \text{ANL}$ $d \leq 0.01 \times 2 \text{ lb}$ $d \leq 0.02 \text{ lb}$
2	Supermarket Deli Scale	<ul style="list-style-type: none"> Most transactions involve weighments between 0.25 lb to 3 lb The average net load is approximately 1 lb Using the formula for a scale with a capacity up to 2500 lb: A division of 0.01 lb or less is suitable 	$d \leq 1 \% \times \text{ANL}$ $d \leq 0.01 \times 1 \text{ lb}$ $d \leq 0.01 \text{ lb}$
3	Specialty Shop Scale – Shopping Mall (30 lb x 0.01 lb electronic scale)	<ul style="list-style-type: none"> Most transactions involve weighments of coffee, tea, tobacco, spices, or chocolates between 0.12 lb (2 oz) to 1 lb The average net load is approximately 0.5 lb Using the formula for a scale with a capacity up to 2500 lb: A division of 0.005 lb or less is suitable, the scale in use is not suitable for this application 	$d \leq 1 \% \times \text{ANL}$ $d \leq 0.01 \times 0.5 \text{ lb}$ $d \leq 0.005 \text{ lb}$
4	Hopper Scale	<ul style="list-style-type: none"> The average net load is approximately 9500 lb Using the formula for a scale with a capacity above 2500 lb: A division of 10 lb or less is suitable 	$d \leq 2 \% \times \text{ANL}$ $d \leq 0.02 \times 9500 \text{ lb}$ $d \leq 19 \text{ lb} * d \text{ is } 10 \text{ lb}$
5	Platform Scale (500 lb x 4 oz scale for buying aluminum cans- new business)	<ul style="list-style-type: none"> Weights and measures informs a business a device is suitable for weighments above 25 lb However the average net load is approximately 5 lb Using the formula for a scale with a capacity up to 2500 lb: A division of 0.05 lb or less is suitable 	$d \leq 1 \% \times \text{ANL}$ $d \leq 0.01 \times 5 \text{ lb}$ $d \leq 0.05 \text{ lb}$
6	Grain Scale	<ul style="list-style-type: none"> Most weighments are used for a moisture test The average net load is 250 g Using the formula for a scale with a capacity up to 2500 lb: A division of 0.1 g is suitable, in fact a $d < 5 \text{ g}$ is suitable 	$d \leq 2 \% \times \text{ANL}$ $d \leq 0.02 \times 250 \text{ g}$ $d \leq 5 \text{ g}$
7	Other Scale	<ul style="list-style-type: none"> Most weighments are of hog heads or sheep The average net load is 200 lb Using the formula for a scale with a capacity up to 2500 lb: A division of 2 lb or is suitable 	$d \leq 1 \% \times \text{ANL}$ $d \leq 0.01 \times 200 \text{ lb}$ $d \leq 2 \text{ lb}$
8	Monorail Scale (packing house)	<ul style="list-style-type: none"> Most weighments are of carcasses The average net load is 180 lb Using the formula for a scale with a capacity up to 2500 lb: A division of 1 lb or less is suitable 	$d \leq 1 \% \times \text{ANL}$ $d \leq 0.01 \times 180 \text{ lb}$ $d \leq 1.8 \text{ lb}$

The Committee considered the CWMA's proposal to add new paragraph UR.1.6. Average Net Load – Class III Scales and associated Table to the Scales Code. The Committee acknowledged that guidelines to assist the scale user, service company, and weights and measures official in determining the suitability of a device for a weighing application are needed and long overdue. The Committee recommends that submitters of future proposals for such guidelines review Measurement Canada's table for minimum net loads. The Canadian table includes guidelines for the minimum net load for weighing applications based on the type of materials weighed. Each application has a minimum net load expressed as a multiple of the verification scale interval (e). The Committee finds that the proposal cannot be uniformly applied to all weighing applications it is intended to cover. Industry opposes the proposal citing that the concept is good, but the guidelines are unenforceable and subjective. Consequently, the Committee withdraws this item from its agenda.

For more background information, refer to the 1992 and 2002 S&T Final Reports.

320-9 VC Appendix D; Definition for Concentrated Load Capacity (CLC); Dual Tandem Axle Capacity

(This item was adopted.)

Source: Carryover Item 320-1B. (This item originated from the National Type Evaluation Technical Committee (NTETC) Weighing Sector and first appeared on the Committee's Agenda in 2001 as Item 320-4.)

Recommendation: Modify the definition of Concentrated Load Capacity in Appendix D as follows:

concentrated load capacity (CLC) (also referred to as Dual Tandem Axle Capacity (DTAC)). A capacity rating of a vehicle, ~~or axle-load, or livestock~~ scale, specified by the manufacturer, defining the maximum load ~~concentration applied by a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet~~ for which the weighbridge is designed. ~~In the case of vehicle and axle-load scales, it is the maximum axle-load concentration (for a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet) for which the weighbridge is designed as specified by the manufacturer.~~ The concentrated load capacity rating is for both test and use. [2.20]

Discussion: In July 2002, the NCWM reconsidered language that prescribed the appropriate test load patterns, maximum test load, and capacity ratings for safe and adequate performance test of vehicle and livestock scales. The NCWM also considered as part of the 2002 proposal, language developed by the Weighing Sector that modified the definition of concentrated load capacity (CLC) to eliminate any reference to livestock scales. The CLC was intended to address the maximum load rating for a weighbridge based on a typical tandem axle vehicle's footprint rather than livestock loading patterns. The Sector's proposal was:

concentrated load capacity (CLC). A capacity rating of a vehicle, ~~or axle-load, or livestock~~ scale, specified by the manufacturer, defining the maximum load ~~concentration applied by a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet~~ for which the weighbridge is designed. ~~In the case of vehicle and axle-load scales, it is the maximum axle-load concentration (for a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet) for which the weighbridge is designed as specified by the manufacturer.~~ The concentrated load capacity rating is for both test and use. [2.20]

The 2002 proposal did not receive the majority vote necessary to make changes to NIST Handbook 44. The item was returned to the Committee and is presented as two separate issues, Item 320-5 (to addresses test load patterns, maximum test load, and capacity ratings) and this recommendation addresses the definition of concentrated load capacity.

At their 2003 meetings, the Western Weights and Measures Association (WWMA) and Southern Weights and Measures Associations (SWMA) agreed to support an alternate proposal to change the definition of CLC. The associations noted that weighbridges are designed for a load applied by a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet. The two (dual) axles are routinely referred to as a tandem axle. Industry representatives reported that dual tandem axle capacity (DTAC) is cited in equipment literature rather than CLC because users are not familiar with the concept of CLC. However, some manufacturers declare a CLC based on the amount of test weight applied during a shift test which exceeds the weighbridge design load. The associations were concerned that manufacturers who declare different CLC and DTAC ratings do not recognize that CLC refers to dual axles and that the ratings might mislead buyers.

The Committee agreed to recommend the WWMA and SWMA definition of concentrated load capacity shown in the recommendation above for adoption at the 2003 NCWM Annual Meeting. The WWMA/SWMA definition of CLC

addresses concerns about the appropriate use of the term DTAC in reference to a scale's rating and removes any reference to livestock scales. The Committee discussed that dual tandem axle vehicles are configured with two wheels on the end of the axle (for a total of eight tires) although it is possible for tandem axles with one wheel on each axle. Dual tandem axle capacity and CLC are equivalent and it would be misleading to state there is any difference. The CLC ratings allow the device user to compare the capacities of different devices. The load pattern and capacity for a device is the same for its dual tandem axle capacity and CLC.

For more background information, refer to the 2001 and 2002 S&T Final Reports.

320-10A V Appendix D; Definitions of Substitution Test and Substitution Test Load

(This item was adopted.)

(Item 320-10 was separated into three parts, Items 320-10A, 320-10B, and 320-10C to facilitate review of the issues.)

Source: Carryover Item 320-8 (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2000 agenda as Item 320-6.)

Recommendation: The Committee recommends that the following definitions for "substitution test" and "substitution test load" be added to NIST Handbook 44, Appendix D; Definitions:

substitution test. - A scale testing process used to quantify the weight of material or objects for use as a known test load.

substitution test load. - The sum of the combination of field standard test weights and any other applied load used in the conduct of a test using substitution test methods.

Discussion/Background: Since 1999, the lack of a definition for the term "substitution test" has created much discussion and confusion between the meaning of the term "substitution load" and other related terms such as "strain load test," "build-up test," and "step test." Many discussions about "substitution tests" have focused on (1) the uncertainties associated with repeating the procedure, (2) the effects of the environment on uncertainties, (3) the ability to bring the amount of substituted materials to the exact amount of known test weights, (4) the need to address operational differences in technology (mechanical vs. electronic) and device types in test procedures, and (5) keeping test procedures separate from definitions.

At the 2002 NCWM Interim Meeting, the Committee agreed that the definition of substitution test developed by the New York Bureau of Weights and Measures adequately described the test load, test procedure, and relevant tolerances without being too restrictive or documenting the details for test procedures. The Committee also agreed with New York's proposed definition of test load which clarified that the term applies to the substitution process.

At the 2002 NCWM Annual Meeting, the Committee also reviewed a NIST recommendation to modify the current definition of "strain-load test" to be more consistent with New York's proposed definition of "substitution test" as follows:

~~strain-load test. The test of a scale beginning with the scale under load and applying known test weights to determine accuracy over a portion of the weighing range. The scale errors for a strain load test are the errors observed for the known test loads only. A scale testing procedure that uses a quantity of unknown material or objects in addition to known test weights in order to test a scale with a load greater than the known test weights. In this procedure, unknown material or objects are used to establish a reference load or tare to which known test weights are added. The tolerances to be applied to the change in indication of the unknown load to the sum of the indications for total unknown load and known test weights are based on the known test weights load used for each error that is determined. Substitution test loads can be used in lieu of known test weights.~~

The proposal developed by New York was kept an information item to allow sufficient time to determine if there are acceptable limits for the variation between the scale indications for known test weight and the substitution load. The Committee also wanted to revise the definition by moving any references to test procedures into the appropriate Examination Procedure Outline.

During its September 2002 Technical Conference, the WWMA agreed to support the definitions for substitution test, substitution test load, and strain load. The WWMA recommended that appropriate procedures be developed for using the substitution test method for mechanical and electronic devices and that the information be included in an Examination Procedure Outline.

At its 2002 Interim Meeting, the CWMA developed an alternate proposal for a new definition of “substitution test” and to modify the current definition of “strain-load test” to eliminate language that referenced test procedures. The CWMA also proposed to eliminate any confusion between the terms substitution test and strain-load test by creating separate procedures and tolerances for each test method.

The Committee heard numerous comments from NCWM members who earlier proposed alternate definitions, but were now in favor of the substitution test and substitution test load definitions, and separate test notes and tolerances for substitution test and strain-load test developed by the CWMA. The Committee found the CWMA proposal effectively separates procedural language from the definitions thereby eliminating any confusion about how to conduct the tests.

The Committee agreed to support CWMA’s proposal shown in the recommendation above. The Committee split the proposal into three separate items, 320-10A, 320-10B, and 320-10C, as recommended by the CWMA.

The Committee agreed with the Scale Manufacturers Association’s recommendation to remove the term “unknown” from the definition for substitution test because it is misleading. The Committee notes that during a substitution test the official knows what materials or objects are substituted but must also quantify them to conduct the test.

For additional background information on this item, refer to the 2000, 2001, and 2002 S&T Final Reports.

320-10B V N.1.11. Substitution Test and T.N.3.11. Tolerances for Substitution Test

(This item was adopted.)

(Item 320-10 was separated into three parts, Items 320-10A, 320-10B, and 320-10C to facilitate review of the issues.)

Source: Carryover Item 320-8 (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee’s 2000 agenda as Item 320-6.)

Recommendation: Add new paragraphs N.1.11. Substitution Test and T.N.3.11. Tolerances for Substitution Test to the NIST Handbook 44 Scales Code as follows:

N.1.11. Substitution Test. - In the substitution test process, material or objects are substituted for known test weights, or a combination of known test weights and previously quantified material or objects, using the scale under test as a comparator. Additional test weights or other known test loads may be added to the known test load to evaluate higher weight ranges on the scale.

T.N.3.11. Tolerances for Substitution Test. - Tolerances are applied to the scale based on the entire test load.

Discussion: Since 1999, the Committee has discussed numerous proposals to define “substitution test” and related terms such as “strain-load test” to clarify any confusion about test methods for large capacity scales.

At its 2002 Interim Meeting, the CWMA developed an alternate proposal for a new definition of “substitution test” and to modify the current definition of “strain-load test” to eliminate any references to test procedures. The CWMA also proposed to eliminate any confusion between the terms substitution test and strain-load test by creating separate procedures and tolerances for each test method.

The Committee heard numerous comments from NCWM members who proposed alternate definitions, but were now in favor of the substitution test and substitution test load definitions and separate test notes and tolerances for substitution test and strain-load test developed by the CWMA. The Committee found the CWMA proposal effectively separates procedural language from definitions thereby eliminating confusion about how to conduct the tests. The Committee may revisit this issue when New York completes its work on procedures that will allow officials to assess the uncertainty for specific scale installations and applications.

The Committee agreed to support CWMA's proposal shown in the recommendation above. The Committee split the proposal into three separate items, 320-10A, 320-10B, and 320-10C, as recommended by the CWMA.

The Committee agreed with the Scale Manufacturers Association's recommendation to remove the term "unknown" from the test note for substitution test because it is misleading. The Committee notes that during a substitution test the official knows what materials or objects are substituted but must also quantify them to conduct the test. The Committee also modified the substitution test tolerance to ensure that tolerances are applied to the entire test load which can be test standards or other quantified material.

The background and rationale for this item are provided in Item 320-10A.

320-10C V N.1.12. Strain-Load Test and T.N.3.12. Tolerances for Strain-Load Test

(This item was adopted.)

(Item 320-10 was separated into three parts, Items 320-10A, 320-10B, and 320-10C to facilitate review of the issues.)

Source: Carryover Item 320-8 (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2000 agenda as Item 320-6.)

Recommendation: Add new paragraphs N.1.12. Strain-Load Test and T.N.3.12. Tolerances for Strain-Load Test to NIST Handbook 44 Scales Code as follows:

N.1.12. Strain-Load Test. - In the strain load test procedure, an unknown quantity of material or objects are used to establish a reference load or tare to which test weights or substitution test loads are added.

T.N.3.12. Tolerances for Strain-Load Test. - The tolerances apply only to the test weights or substitution test load.

Modify Table 4 Minimum Test Weights and Test Loads Note 3 as follows:

³ The scale shall be tested from zero to at least 12.5 % of scale capacity using known test weights and then to at least 25 % of scale capacity using either a substitution or strain load test that utilizes known test weights of at least 12.5 % of scale capacity. Whenever practical, a strain-load test should be conducted to the used capacity of the scale. When a strain load test is conducted, the tolerances applies only to the ~~known~~ test load weights and substitution test load.

Discussion: Since 1999, the Committee has discussed numerous proposals to define "substitution test" and related terms such as "strain-load test" to clarify any confusion about test methods for large capacity scales.

At its 2002 Interim Meeting, the CWMA developed a proposal to modify the current definition of "strain-load test" to eliminate all procedural language. The CWMA also proposed to eliminate any confusion between the terms substitution test and strain-load test by creating separate procedures and tolerances for each test method.

The Committee heard numerous comments from NCWM members who proposed alternate definitions, but were now in favor of the substitution test and substitution test load definitions and separate test notes and tolerances for substitution test and strain-load test developed by the CWMA. The Committee found the CWMA proposal effectively separates procedural language from definitions thereby eliminating confusion on how to conduct the tests. The Committee may revisit this issue when New York completes its work on procedures that will allow officials to assess the uncertainty for specific scale installations and applications.

The Committee agreed to support CWMA's proposal shown in the recommendation above. The Committee split the proposal into three separate items, 320-10A, 320-10B, and 320-10C, as recommended by the CWMA.

The Committee clarified that in the strain-load test procedure it is an unknown quantity of material or objects that are used to establish a reference load or tare to which either test weights or a substitution test load is added to reach scale capacity. The Committee modified paragraph T.N.3.12. for the strain load test tolerance to agree with the strain-load test

tolerances described in Table 4 Minimum Test Weights and Test Loads. The Committee noted that there should be consistency in the terminology used in related requirements in the Scales Code.

The background and rationale for this item are provided in Item 320-10A

320-11 I N.1.3.4.X. Weight Carts

Source: Northeastern Weights and Measures Association (NEWMA)

Recommendation: Add new paragraph N.1.3.4.1. to the Scales Code as follows:

N.1.3.4.X. Weight Carts. - Weight carts may be included as part of the minimum required test load required in N.1.3.4. provided that the mass value of the weight cart has been determined by weights and measures and is clearly marked thereon. Further, a certificate of calibration issued by the weights and measures jurisdiction that issued the weight certificate must be available at all times. Said certificate shall contain at a minimum the following information: date of calibration, name, model, and serial number of the weight cart, the minimum graduation of the scale used in the calibration of the weight cart, and the name of the jurisdiction and inspector or metrologist who determined the mass value.

Discussion: This item first appeared on the Committee's 2003 agenda as Developing Item 360-3, Appendix B Item 1. The Committee changed the proposal's status to an information item because corresponding work to develop weight cart standards was nearing completion on NIST 105-8, "Specifications and Tolerances for Field Standard Weight Carts." This proposal is intended to modify the NIST Handbook 44 Scales Code to recognize the use of weight carts during a shift test

The Committee heard comments from the private and public sectors. The Scale Manufacturers Association supported the proposal. Several weights and measures jurisdictions indicated concern about how their weight carts will comply with Handbook 105-8, especially the requirement for a maximum fuel tank capacity of one gallon.

The NIST Working Group on Weight Carts conducted more in depth reviews of fuel tank requirements. The Working Group planned to define a reasonable standard that allows existing weight carts to operate. Other issues briefly discussed were the effects of weight cart uncertainties on the error limits for standards specified in Appendix A Fundamental Considerations Associated with the Enforcement of Handbook 44 Codes.

The Committee upgraded the proposal's status from a developing item to an information item in anticipation of the final publication of Handbook 105-8 to ensure that work on the proposed Handbook 44 standard is consistent with corresponding standards in Handbook 105-8.

The Committee did not receive further comments on this item. The work to complete NIST Handbook 105-8 was scheduled for completion after the Committee met during the NCWM 2003 Annual Meeting. The Committee acknowledged that historically the field standard verification intervals are established as often as regulation and circumstances warrant by the jurisdiction. The weight cart standards for accuracy and traceability are addressed in the Handbook 105 series.

322 Automatic Bulk Weighing Systems

322-1 I Tolerances

Source: Carryover Item 322-1. This item originated from the Northeastern Weights and Measures Association (NEWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Delete paragraphs T.1.4., T.2., T.2.1, T.3.2. and T.3.3.; renumber paragraphs T.3. and T.3.1.; add new paragraphs T.2.2, T.2.3., and T.2.3.1., Table 1, and Table 2; and add a new footnote to Section 2.20 Scales Table 1.1.1. as follows:

~~**T.1.4. To Tests Involving Digital Indications or Representations. To the tolerances that would otherwise be applied, there shall be added an amount equal to one-half the value of the scale division. This does not apply to digital indications or recorded representations that have been corrected for rounding using error weights.**~~

~~**T.2. Minimum Tolerance Values. - The minimum tolerance value shall not be less than half the value of the scale division.**~~

~~**T.2.1. For Systems used to Weigh Construction Materials. - The minimum maintenance and acceptance tolerance shall be 0.1 percent of the weighing capacity of the system, or the value of the scale division, whichever is less .**~~

~~**T.3.2. For Systems used to Weigh Grain. - The basic maintenance tolerance shall be 0.1 percent of test load.**~~

~~**T.3.3. For all Other Systems. - The basic maintenance tolerance shall be 0.2 percent of test load.**~~

Renumber paragraphs T.3. and T.3.1. as follows:

T.3.2. Basic Tolerance Values.

T.3.2.1. Acceptance Tolerance. -The basic acceptance tolerance shall be one-half the basic maintenance tolerance but never less than 1 division.

Add new paragraphs T.2.2, T.2.3., and T.2.3.1., Table 1, and Table 2 as follows:

T.2.2. General. - The tolerance applicable to devices not marked with an accuracy class shall have the tolerances applied as specified in Table 1. below.

Table 1. Tolerance for Unmarked Scales			
<u>Type of Device</u>	<u>Tolerance</u>	<u>Decreasing Load Multiplier</u>	<u>Other applicable Requirements</u>
<u>Grain Hoppers</u>	<u>Class III, T.2.3 (Table 2)</u>	<u>1.0</u>	<u>T.2.1., T.2.3.1</u>
<u>Other Systems</u>	<u>Class III L, T.2.3 (Table 2)</u>	<u>1.0</u>	<u>T.2.1., T.2.3.1</u>

T.2.3. Tolerances Applicable to Devices Marked III or III L.

T.2.3.1. Maintenance Tolerance Values - The maintenance tolerance values are specified in Table 2 below.

Table 2. Maintenance Tolerance for Marked Scales				
<u>(All values in this table are in scale divisions)</u>				
<u>Tolerance in scale divisions</u>				
	<u>1</u>	<u>2</u>	<u>3</u>	<u>5</u>
<u>Class</u>	<u>Test Load</u>			
<u>III</u>	<u>0 - 500</u>	<u>501 - 2000</u>	<u>2001 - 4000</u>	<u>4001 +</u>
<u>III L</u>	<u>0 - 500</u>	<u>501 - 1000</u>	<u>(Add 1d for each additional 500 d or fraction thereof)</u>	

Add a new footnote to Section 2.20 Scales Code Table 1.1.1. Tolerances for Unmarked Scales as follows:

^xAutomatic bulk weighing systems see Section 2.22 for specifications and tolerances.

Discussion: NEWMA recommended changing the prescribed tolerances for automatic bulk weighing systems from a percentage basis to division values which are based on the device's accuracy class. NEWMA believes this change will align tolerances in the Automatic Bulk Weighing Systems (ABWS) Code and Scales Code. Additionally, NEWMA believes a footnote should be added to the Scales Code Table T.1.1. to avoid any confusion over which devices that can be classified as automatic bulk weighing systems.

The Committee recognized there is confusion over which weighing systems fall under the Automatic Bulk Weighing Systems Code. At the 2002 NCWM Annual Meeting, the Committee encouraged the Technical Advisors to develop materials on automatic bulk weighing systems in time for presentations at the 2002 fall regional weights and measures association meetings. Consequently, the Committee kept this an information item.

During the its September 2002 Technical Conference, the Western Weights and Measures Association joined the USDA Grain Inspection Packers and Stockyard Administration (GIPSA) in expressing concerns about the proposed increases to tolerances for automatic bulk weighing systems. Consequently, the WWMA recommended the NCWM S&T Committee withdraw this item.

NEWMA reported that New York supports returning the item to voting status. New York believes the changes to the tolerances are necessary to align this code with the Scale Code. At the 2003 NCWM Interim Meeting, New York provided the Committee and GIPSA with charts and tables to demonstrate that the proposed tolerances, based on scale divisions, would result in minor changes in the current tolerances. The charts were available.

The Committee acknowledged there is still confusion about which code applies to hopper scales such as systems used in grain and asphalt applications. The entire weights and measures community would benefit from efforts to clarify this point. The Committee notes that adding a controller to a hopper or a hopper that makes a limited number of drafts (continuous) cannot be classified as an ABWS. Typically, an ABWS must record a load and no load for each successive draft.

The Committee made the proposal an information item to allow GIPSA and New York additional time to work through accuracy class and percentage based tolerance data. Both agencies reiterated their earlier positions on modifying the ABWS Code tolerances. GIPSA indicated there is a problem with the proposal because it represents a tolerance based on accuracy class which results in a substantial cumulative error. New York stated the benefits to an accuracy class tolerance go beyond harmonizing the requirements in the ABWS and Scales Codes. One option discussed to resolve GIPSA's concerns about the impact of the proposed tolerances on weighing operations, where GIPSA has oversight, is to create an exemption for all grain scales similar to what exist in the Scales Code.

The Committee encourages New York and GIPSA to continue their work to develop a set of tolerances that is mutually agreeable and appropriate for ABWS.

For more background information, refer to the 2002 S&T Final Report.

324 Automatic Weighing Systems

324-1 I Tentative Status of the Automatic Weighing Systems Code

Source: Carryover Item 324-1. (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Change the status of the Automatic Weighing Systems (AWS) Code from tentative to permanent.

Discussion: The Automatic Weighing Systems Code was added to the 1996 edition of NIST Handbook 44 as a Tentative Code. In 2002, the adoption of the code as a permanent code in Handbook 44 was delayed to resolve issues with several NTEP test criteria which are based on the code's requirements. On October 2-3, 2002, in Annapolis, Maryland, a work group met to review any remaining code issues. The group discussed Handbook 44 requirements that limit a device to operating in a single unit of measure. The group questioned the need for NTEP laboratories to perform line frequency and barometric pressure tests. The group also noted that there are inconsistencies in the titles of several requirements. The Committee recognized that the entire AWS Work Group has not had the opportunity to review and comment on a first draft of proposed changes to the AWS Code. The Committee also heard that one member of the AWS Group plans to submit changes to the draft. Therefore, the Committee made the proposal an information item.

During its 2003 NCWM Annual Meeting Open Hearing session, the Committee was notified by NIST that the Work Group's final comments are available in electronic format. The Committee requested that all interested parties review this document. The Committee anticipates that the AWS Work Group will shortly conclude its work on any remaining issues with the AWS Code and any recommendations to modify Handbook 44 will be reviewed at the fall 2003 Weighing Sector and regional weights and measures associations meetings.

For more background information, refer to the 2002 S&T Final Report.

330 Liquid-Measuring Devices

330-1 I S.2.2.1. Multiple Measuring Elements With a Single Provision for Sealing

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Add new paragraph to NIST Handbook 44, Section 3.30. Liquid-Measuring Devices S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing as follows:

S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing. - A change to the adjustment of any measuring element within any multi-product dispenser with a single provision for sealing multiple measuring elements must be identified.

Background/Discussion: At the June 2002 NTEP Laboratory Meeting, one of the participating laboratories indicated that field officials in their jurisdiction are having difficulty with multi-product dispensers that have only one sealing mechanism for two or more measuring elements. If a field official rejects a meter for not meeting performance requirements, they have no way of determining which measuring elements have been recalibrated when they reinspect the dispenser. During reinspection, the field official may be required to test all grades and blends offered through the rejected dispenser to determine that only the rejected measuring element was adjusted.

At its October 2002 meeting, the NTETC Measuring Sector developed the proposal shown above which requires devices to provide a clear indication of which measuring elements have been adjusted. The Sector agreed to forward the proposal to the Committee for consideration.

At its October 2002 Annual Meeting, the SWMA recommended that the proposal to add a new paragraph to NIST Handbook 44, Section 3.30. Liquid-Measuring Devices paragraph S.2.2.1. be forwarded to the Committee as an information item.

At the 2003 NCWM Interim Meeting, the Committee heard support for clearly identifying, in a manner that is readily available to the field official, any measuring element that is adjusted and agreed that the item has merit. Device manufacturers stated that identifying any measuring element that is adjusted is possible on dispensers that have only one sealing mechanism for two or more measuring elements. The Committee gave the item informational status to provide device manufacturers the opportunity to study the issue and develop means for complying with the proposed requirements.

At the 2003 NCWM Annual Meeting, the Committee heard support for the item. One manufacturer opposed the item because they believe that the proposal means a lead wire seal is no longer a sufficient method of sealing; however, their company is looking at ways to be able to meet the proposed requirement. The Committee agreed that the item should remain an information item to provide device manufacturers additional time to develop means for complying with the proposed requirements.

330-2 VC S.4.4.1. Discharge Rates

(This item was adopted.)

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Modify NIST Handbook 44, Section 3.30. Liquid-Measuring Devices (LMD) S.4.4.1. as follows:

S.4.4.1. Discharge Rates. - On a retail device with a designed maximum discharge rate of 115 L (30 gal) per minute or greater, the maximum and minimum discharge rates shall be marked ~~on an exterior surface of the device and shall be visible after installation~~ in accordance with S.4.4.2. The marked minimum discharge rate shall not exceed 20 % of the marked maximum discharge rate.

Example: With a marked maximum discharge rate of 230 L/min (60 gpm), the marked minimum discharge rate shall be 45 L/min (12 gpm) or less (e.g., 40 L/min (10 gpm) is acceptable). A marked minimum discharge rate greater than 45 L/min (12 gpm) (e.g., 60 L/min (15 gpm)) is not acceptable.

Background/Discussion: During its 2002 Annual Meeting, the NCWM amended LMD Code paragraph S.4.4. Retail Devices by adding a new paragraph, S.4.4.2. *Location of Marking Information; Retail Motor-Fuel Dispenser* that requires that markings for G-S.1. Identification be located within a specified range of heights either inside or on the outside of the dispenser. During the 2002 Measuring Sector meeting, it was noted that the marking requirements for discharge rates are required to be located on an external surface of the device without any reference to being located within a specified height range. The Sector indicated that it is also appropriate to include the markings for discharge rates required in paragraph S.4.4.1. with the other markings in accordance with the requirements of paragraph S.4.4.2. Some weights and measures officials have incorrectly interpreted paragraph S.4.4.1. to mean that a flow rate greater than or less than 20 % of the maximum discharge is not acceptable. The Sector agreed to forward a proposal to the S&T Committee through the SWMA to modify S.4.4.1. that includes an example of how the requirement should be applied as shown above.

At its October 2002 Annual Meeting the SWMA supported the proposed modification to S.4.4.1. and the example and recommended it be forwarded to the S&T Committee as a voting item.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on this item and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

At the 2003 NCWM Annual Meeting, the Committee heard no opposition to this item. The Committee was asked to clarify that the minimum and maximum discharge rates referred to rates marked on the device and not the rates developed at an installation. The committee agreed to modify the proposed S.4.4.1. to clarify that the minimum and maximum discharge rates in the proposal refer to the marked minimum and maximum discharge rates. The committee also agreed that a reference to the example in S.4.4.1. should be added to S.5.2. in Section 3.31. Vehicle-Tank Meters, S.4.2. in Section 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices, S.4.2. in Section 3.35 Milk Meters, and S.4.2. in Section 3.38 Carbon Dioxide Liquid-Measuring Devices.

330-3 W UR.1.2. Nozzle Requirements

(This item was withdrawn.)

Source: Carryover Item 330-4. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Add a new paragraph to NIST Handbook 44, Section 3.30. Liquid-Measuring Devices UR.1.2. as follows:

UR.1.2. Nozzle Requirements for Diesel. On a retail motor-fuel device any hose from which diesel fuel is sold shall have a nozzle with an outside diameter of not less than 23.6 mm (0.93 in).

Background/Discussion: At the August 2001 WWMA Conference, Idaho Weights and Measures reported receiving complaints from consumers who accidentally put diesel fuel into a gasoline-powered vehicle. The complaints were investigated and inspectors found that the pumps were properly labeled, but people still accidentally selected the wrong product. The intention of the proposed user requirement is to reduce the chances of accidentally putting diesel fuel into a gasoline-powered vehicle. Idaho reported that many retail motor-fuel dispenser manufacturers follow the minimum size specification in the Society of Automotive Engineers (SAE) Recommended Practice, J285, revised September 1992. SAE, J285 recommends that nozzle spouts for unleaded fuels have a nominal outside diameter of 20.6 mm (13/16 in) and that for all other fuels the nominal outside diameter should be 23.8 mm (15/16 in), but not less than 23.6 mm (0.93 in). However, station owners and service agents frequently replace these nozzles with nozzles that have a spout designed for dispensing unleaded gasoline. Since 1992 date automotive manufacturers have recommended for some time that fueling components meet this specification so that nozzles dispensing diesel fuel will not fit into the filler neck of unleaded gasoline powered vehicles.

At the 2002 NCWM Annual Meeting, this item did not pass or fail; therefore, it was returned to the Committee for further consideration.

At its September 2002 Interim Meeting, the Central Weights and Measures Association recommended that this item be moved to the L&R Committee Agenda.

At its September 2002 Annual Meeting, the WWMA received documentation that the SAE Recommended Practice, J285, was reaffirmed in 1999. The WWMA recommended that the proposal be modified to include an effective date of January 1, 2005.

At its October 2002 Interim Meeting, the Northeastern Weights and Measures Association recommended that this item be withdrawn from the agenda.

At its October 2002 Annual Meeting, the Southern Weights and Measures Association was provided information on the cost of a nozzle spout for unleaded fuel and the recommended larger spout for diesel fuel to demonstrate that this proposal would cause no economic hardship for device owners and continues to support this item.

At the 2003 NCWM Interim Meeting, the Committee heard comments similar to those received at previous meetings that relate to whether or not this is a weights and measures enforcement problem. The Committee agreed to present the item for a vote at the 2003 NCWM Annual Meeting and let the NCWM vote the item up or down.

At the 2003 NCWM Annual Meeting, Florida, North Carolina, and Missouri supported this item. California, Iowa, Michigan and the Michigan Weights and Measures Association opposed the item. Wisconsin agreed there is a problem, but didn't believe it is a weights and measures issue and therefore opposed this item. One official stated that passing this item would not solve the problem, he stated that it is the responsibility of service station industry to resolve the problem. Another official stated that this is a weights and measures issue. The Committee agreed that if this item remained a voting item it would not receive sufficient yeas votes to pass or nay votes to fail and would return to the Committee as it did last year. The Committee decided that since there is a similar proposal being considered by the Laws and Regulations Committee for adding a requirement to Handbook 130, Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation, Item 330-3 should be withdrawn from the Committee's Agenda.

For more background information, refer to the NCWM 2002 S&T Final Report.

330-4 I UR.2.5.1. Measuring Element Identification, and UR.2.5.2. Product Storage Identification

(This item was changed from a voting item to an information item at the 2003 NCWM Annual Meeting)

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Modify NIST Handbook 44, Section 3.30. Liquid-Measuring Devices UR.2.5. as follows:

UR.2.5. Product Storage Identification.

UR.2.5.1. Measuring Element Identification.

- (a) **The measuring elements of any multi-product dispenser shall be permanently, plainly, and visibly identified as to product being measured.**
- (b) **When the measuring elements of any multi-product dispenser are marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.**

UR.2.5.2. Product Storage Identification.

- (a) **The fill connection for any petroleum product storage tank or vessel supplying motor-fuel devices shall be permanently, plainly, and visibly marked as to product contained.**
- (b) **When the fill connection device is marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.**

Background/Discussion: At the June 2002 NTEP Laboratory Meeting, one of the participating laboratories indicated that field officials in their jurisdiction are sometimes unable to determine which measuring element is associated with a particular grade or blend of fuel on multi-product dispensers. This is because some newer dispensers, have measuring elements with no external drive to a pulser or mechanical indicator, and therefore provide no visible means for the official to be able to determine when a specific measuring element is in operation. During a field examination of a multi-product

dispenser if one grade or blend is rejected for not meeting performance requirements, the official does not know which measuring element to mark or tag as rejected. During reinspection, the field official may be required to test all grades and blends offered through the rejected dispenser to determine that only the rejected measuring element was adjusted.

At its October 2002 meeting, the NTETC Measuring Sector developed a proposal that requires a measuring element without an individual physical seal within any multi-product dispenser be plainly and visibly identified as to the product being measured. The Sector agreed to forward the proposal to the Committee through the SWMA.

At its October 2002 Annual Meeting, the SWMA recommended that the proposed modification to NIST Handbook 44, Section 3.30. Liquid-Measuring Devices paragraph UR.2.5. be forwarded to the Committee as a voting item.

At the 2003 NCWM Interim Meeting, the Committee heard support for the proposal. Device manufacturers agreed that this requirement would also assist service agencies to identify measuring elements needing adjustment. The manufacturers also reported that, the majority of the devices currently in the market place have external moving parts that facilitate the association of a specific measuring element with the product type being delivered. The Committee believes it is important that a field official be able to identify the product delivered by each measuring element and agreed to present the item for a vote at the 2003 NCWM Annual Meeting.

At the 2003 NCWM Annual Meeting, a manufacturer of retail motor-fuel dispensers stated that the company makes some dispensers where the measuring elements are not readily accessible. A representative of a fuel distribution company asked if the requirement would be retroactive or nonretroactive. As a retroactive requirement could create a hardship for service station owners. WMD suggested that if color codes are to be used for identifying measuring elements and for product storage within the same facility they should be consistent. The Committee agreed that if a color code is used for identifying measuring elements and product storage fill connections they should be the same. The Committee changed the item to informational and requested that the NTETC Measuring Sector reconsider the proposal to clarify that the requirement is intended to apply to measuring elements that have no visible moving mechanical parts and whether or not the requirement should be retroactive.

330-5 V UR.3.6.3. Temperature Compensation Wholesale – When to be Used

(This item was adopted.)

Source: Southern Weights and Measures Association (SWMA)

Recommendation: Revise NIST Handbook 44, Section 3.30. Liquid-Measuring Devices by adding a new paragraph UR.3.6.3. that requires the buyer and seller of products measured or calculated using temperature compensation to do so for a twelve-month period, unless mutually agreed in writing to do otherwise. The revision is as follows:

UR.3.6.3. Period of Use - When fuel is bought or sold on an automatic or nonautomatic temperature-compensated basis, it shall be ~~done~~ bought or sold using this method over at least a consecutive 12-month period, unless otherwise agreed to by the buyer and the seller in writing.

Background/Discussion: At the 2002 SWMA Annual Meeting, a weights and measures official expressed concern that temperature compensation is being selectively used during different times of the year. Depending on the temperature during the measurement, the product may be expanded or contracted and either the buyer or the seller may have an advantage. If a company uses temperature compensation, it must be used for a consecutive 12-month period to prevent selective use of temperature compensation. The SWMA agreed that the issue has merit and recommended it be forwarded to the Committee as an information item.

At the 2003 NCWM Interim Meeting, comments made during the open hearings suggested that the requirement should clearly state that it applies to sales that are compensated for the effect of temperature whether the compensation is done automatically or manually using a calculator and that any agreement between the buyer and seller to not use temperature compensation should be in writing. The Committee agreed and developed the new paragraph UR.3.6.3. (proposed as a revision to paragraph UR.3.6.1.2. in the 2003 Interim agenda) shown above to be presented for a vote at the Annual Meeting.

At the 2003 NCWM Annual Meeting, the Meter Manufacturer's Association (MMA) supported this item. The Committee received objections to this item. The paragraph number for this item was changed in Publication 16, but the

title for this item was not. The Committee modified the title and agreed that in the proposed paragraph UR.3.6.3, the word “done” should be replaced with the words “bought or sold using this method.”

330-6 I Appendix D; Definition of Retail Device

Source: Carryover Item 330-7 (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee’s 1999 agenda as Item 330-5.)

Recommendation: Modify the definition of retail devices as follows:

retail device. A device primarily used for non-resale use.

~~single deliveries of less than 378 L (100 gal),~~

~~retail deliveries of motor fuels to individual highway vehicles, or~~

~~single deliveries of liquefied petroleum gas for domestic use and liquefied petroleum gas or liquefied anhydrous ammonia for nonresale use.~~

[3.30, 3.31, 3.32, 3.37]

Background/Discussion: During the 2001 NCWM Annual Meeting, the Committee considered several proposals that define retail devices as those that deliver product to the ultimate consumer. The Committee agreed that these proposals change the classification of some devices, previously classified as wholesale devices, to retail devices that are held to a lesser tolerance.

In 2002 the Committee agreed that if the proposals in Items 330-3A, 330-3B, and 331-3, to base tolerances on accuracy classes rather than the application of the device were adopted, changes to the definition would be unnecessary and this item could be withdrawn from its agenda. Items 330-3A and 331-3 were adopted. Item 330-3B was carried over as informational to provide the regional associations the opportunity to identify and discuss any negative impact it would have on the affected codes in NIST Handbook 44.

At its September 2002 Interim Meeting, the Central Weights and Measures Association agreed that the word “primarily” is ambiguous and should be removed from the proposal.

At its September 2002 Annual Meeting, the WWMA supported the item as proposed.

At its October 2002 Interim Meeting, the Northeastern Weights and Measures Association (NEWMA) agreed that this item is unnecessary if accuracy classes are adopted for Section 3.32. through Section 3.36. and Section 3.38.

At the 2003 NCWM Interim Meeting, the Committee heard that even with the adoption of the accuracy class tables last year, a definition of “retail device” is still needed because the term retail is referenced in several paragraphs in the Liquid-Measuring Devices code and in other measuring device codes of NIST Handbook 44. The Committee believes that the term “primarily” in the retail device definition, is appropriate to provide weights and measures officials some flexibility for determining the applicability of various requirements on a case-by-case basis. The Committee agreed that the item should remain informational to allow further study of all the codes potentially affected by the change.

At the 2003 NCWM Annual Meeting, the Committee heard that at its May 2003 Meeting, the NEWMA received comments that the use of the word “primarily” and the phrase “non-resale use” are not definitive and will lead to further confusion. WMD recommended an alternate definition of retail device as follows:

retail device. A device primarily used for weighing or measuring a finished product or commodity that will not be offered for sale in the same form.

The Committee agreed that the item should remain informational to allow further consideration by the regional weights and measures associations.

For more background information, refer to the 1999 through 2002 S&T Final Reports.

331 Vehicle-Tank Meters

331-1 V Recognition of Temperature Compensation

(This item did not pass or fail; therefore it returns to the Committee.)

Source: Carryover Item 331-1 (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2000 agenda as Item 331-1.)

Recommendation: Modify NIST Handbook 44, Section 3.31. Vehicle-Tank Meters Code (VTM) by adding the following paragraphs to recognize temperature compensation as follows:

S.2.4. Automatic Temperature Compensation for Refined Petroleum Products.

S.2.4.1. Automatic Temperature Compensation for Refined Petroleum Products. - A device may be equipped with an automatic means for adjusting the indication and registration of the measured volume of product to the volume at 15 °C (60 °F), where not prohibited by State Law.

S.2.4.2. Provision for Deactivating. - On a device equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of liters (gallons) compensated to 15 °C (60 °F), provision shall be made for deactivating the automatic temperature-compensating mechanism so that the meter can indicate and record, if it is equipped to record, in terms of the uncompensated volume.

S.2.4.2.X. Gross and Net Indications – A device equipped with automatic temperature compensation shall indicate and record, if equipped to record, both the gross (uncompensated) and net (compensated) volume for testing purposes. If both values cannot be displayed or recorded for the same test draft, means shall be provided to select either the gross or net indication for each test draft.

S.2.4.3. Provision for Sealing Automatic Temperature Compensating Systems. – Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that an automatic temperature-compensating system cannot be disconnected and that no adjustment may be made to the system.

S.2.4.4. Temperature Determination with Automatic Temperature Compensation. - For test purposes, means shall be provided (e.g., thermometer well) to determine the temperature of the liquid either:

- (a) in the liquid chamber of the meter, or
- (b) immediately adjacent to the meter in the meter inlet or discharge line.

S.5.6. Temperature Compensation for Refined Petroleum Products. - If a device is equipped with an automatic temperature compensator, the primary indicating elements, recording elements, and recording representation shall be clearly and conspicuously marked to show that the volume delivered has been adjusted to the volume at 15 °C (60 °F).

N.4.1.3. Automatic Temperature Compensating Systems for Refined Petroleum Products. - On devices equipped with automatic temperature-compensating systems, normal tests shall be conducted:

- (a) by comparing the compensated volume indicated or recorded to the actual delivered volume corrected to 15 °C (60 °F); and
- (b) with the temperature-compensating system deactivated, comparing the uncompensated volume indicated or recorded to the actual delivered volume.

The first test shall be performed with the automatic temperature-compensating system operating in the "as found" condition. On devices that indicate or record both the compensated and uncompensated volume for each delivery, the tests in (a) and (b) may be performed as a single test.

N.5. Temperature Correction for Refined Petroleum Products. - Corrections shall be made for any changes in volume resulting from the differences in liquid temperatures between the time of passage through the meter and time of volumetric determination in the prover. When adjustments are necessary, appropriate petroleum measurement tables should be used.

T.2.1. Automatic Temperature-Compensating Systems. - The difference between the meter error (expressed as a percentage) for results determined with and without the automatic temperature-compensating system activated shall not exceed:

- (a) 0.4 % for mechanical automatic temperature-compensating systems; and
- (b) 0.2 % for electronic automatic temperature-compensating systems.

The delivered quantities for each test shall be approximately the same size. The results of each test shall be within the applicable acceptance or maintenance tolerance.

UR.2.5. Temperature Compensation for Refined Petroleum Products.

UR.2.5.1. Automatic.

UR.2.5.1.1. When to be Used. - In a State that does not prohibit, by law or regulation, the sale of temperature-compensated product, a device equipped with an operable automatic temperature compensator shall be connected, operable, and in use at all times. An electronic or mechanical automatic temperature compensating system may not be removed, nor may a compensated device be replaced with an uncompensated device, without the written approval of the responsible weights and measures jurisdiction.

[Note: This requirement does not specify the method of sale for product measured through a meter.]

UR.2.5.1.2. Invoices.

- (a) An invoice based on a reading of a device that is equipped with an automatic temperature compensator shall show that the volume delivered has been adjusted to the volume at 15 °C (60 °F).

Discussion/Background: When this item was submitted, weights and measures officials indicated confusion when an NTEP Certificate of Conformance (CC) for a meter includes a temperature-compensation feature, but the application section of the CC is for a vehicle-tank meter (VTM) and Handbook 44 does not recognize temperature compensation for VTMs. The WWMA acknowledged that there are jurisdictions that permit temperature compensated deliveries in applications that are not addressed by NIST Handbook 44. Some states do not allow the use of automatic temperature compensation for the delivery of products using VTMs.

At the 2002 NCWM Interim and Annual Meeting, the Committee received comments in support of this item because the language does not require the use of temperature compensation, but does provide inspection notes for those jurisdictions that have temperature compensated vehicle-tank meters in use. The item provides specifications, tolerances, test notes, and user requirements if a temperature compensated device is used. The Committee did hear some opposition to the proposal from officials who believe they would be forced to accept temperature compensated vehicle-tank meters because there is not a specific prohibition in their weights and measures law; however, the Committee concluded that the opposition was not supported by a technical argument and there are other means for prohibiting the use of temperature compensated vehicle-tank meters in a particular state if the prohibition is justified. The Committee agreed to present the item for a vote at the 2002 NCWM Annual Meeting.

At the 2002 NCWM Annual Meeting, this item did not pass or fail; therefore, it was returned to the Committee for further consideration.

At its September 2002 Interim Meeting, the Central Weights and Measures Association (CWMA) reaffirmed its recommendation that the L&R Committee adopt appropriate language for a method of sale requirement for temperature compensated vehicle-tank meters to promote uniformity.

At its September 2002 Annual Meeting, the WWMA supported this item as proposed and recommended that the Committee move it forward as a voting item.

At its October 2002 Interim Meeting, the Northeastern Weights and Measures Association (NEWMA) recommended that the NCWM S&T Committee move this item forward as a voting item.

At the 2003 NCWM Interim Meeting, the Committee heard both support and opposition to this item for similar reasons expressed at earlier meetings. The Meter Manufacturer's Association (MMA) indicated that the proposed tolerances in T.2.1. of 0.2 % for mechanical automatic temperature-compensating systems and 0.1 % for electronic automatic temperature-compensating systems were too restrictive and should be changed to 0.4 % for mechanical systems and 0.2 % for electronic systems. The Committee agreed with the MMA and modified T.2.1. accordingly. The Committee agreed to present the item for a vote at the 2003 NCWM Annual Meeting as shown above.

At their Spring 2003 Annual Meetings, the CWMA and NEWMA supported this item as written.

At the 2003 NCWM Annual Meeting, the MMA supported the proposal. One official stated that a method-of-sale requirement for temperature compensation of petroleum products delivered using vehicle-tank meters should be in Handbook 130 before this item is adopted. Another official stated that this item is not equitable unless all states require temperature compensation of petroleum products delivered using vehicle-tank meters.

For additional background on this item see the NCWM 2000 through 2002 S&T Final Reports.

331-2 W S.3.5. Discharge Valve

(This item was withdrawn.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Revise NIST Handbook 44, Section 3.31. Vehicle-Tank Meters by amending S.3.5. as follows:

S.3.5 Discharge Valve. - A discharge valve may be installed in the discharge line only if the device is of the wet-hose type or is incorporated within an automatic pump discharge system, in which case such valve shall be at the discharge end of the line. Any other shutoff valve on the discharge side of the meter shall be of the automatic or semiautomatic predetermined-stop type or shall be operable only:

- (a) by means of a tool (but not a pin) entirely separate from the device, or
- (b) by mutilation of a security seal with which the valve is sealed open.

Discussion: A manufacturer of vehicle-tank metering systems put forth this proposal as part of its endeavor to have dry-hose delivery systems recognized in NIST Handbook 44. The changes proposed to NIST Handbook 44 were believed necessary to allow the systems to begin the NTEP process. These systems would have had to be evaluated for accuracy, repeatability and other requirements. The systems are currently in use in Germany and the United Kingdom.

At its September 2002 Annual Meeting, the WWMA recommended this item move forward as an information item.

At its October 2002 Annual Meeting, the Southern Weights and Measures Association (SWMA) recommended that this item move forward as an information item. Because the system uses compressed air to purge the delivery hose the SWMA has concerns with the repeatability and performance accuracy for the described system and does not support changing NIST Handbook 44 until the manufacturer provides performance data for consideration.

At the 2003 NCWM Interim Meeting, the Committee received a request from original submitter of the proposal to withdraw the item because they had encountered difficulty in collecting sufficient data to verify accuracy and

repeatability of their system. The Committee agreed with the support of the committee representatives from the WWMA and the SWMA.

331-3 W S.3.2.X. Automatic Pump Discharge Unit

(This item was withdrawn.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Revise NIST Handbook 44, Section 3.31. Vehicle-Tank Meters by adding a Specification S.3.2.X Automatic Pump Discharge Unit as follows:

S.3.2.X. Automatic Pump Discharge Unit. - On an automatic pump discharge unit, the discharge hose may be of the dry-hose type with a shutoff valve at its outlet end, but only if:

- (a) the pump discharge unit is completely automatic in that all openings and closing of valves incorporated within the system are controlled absolutely by the system, and
- (b) a means is provided to ensure that the pump discharge system will be dry at the beginning and the end of each delivery, and
- (c) a means is incorporated within the pump discharge system that detects if the hose end shutoff valve or any other valve downstream of the system is closed prematurely during the purging of the system to its dry state, thus preventing a complete delivery. In this case, means must be provided so that it will be impossible to end the delivery and print a delivery ticket. The system must provide the facility to automatically clear the discharge lines once the hose end shutoff valve has been opened or the obstruction preventing a complete delivery is removed, and
- (d) in the event that a delivery is terminated before the pre-set quantity is reached or the delivery quantity is unknown at the beginning of the delivery, then means must be provided to return the product contained within the pump discharge system back to the tank truck compartment and be fully discharged so as to bring the system back to its dry state. The system must ensure that product is returned to the tank truck and that this quantity does not form part of the delivered quantity.
- (e) There shall be incorporated an automatic vacuum breaker or equivalent means to prevent siphoning and to ensure the rapid and complete drainage of the automatic pump discharge unit.

Discussion: A manufacturer of vehicle-tank metering put forth this proposal as part of its endeavor to have dry hose delivery systems recognized in NIST Handbook 44. The changes proposed to Handbook 44 were believed necessary to allow the systems to begin the NTEP process. These systems would have had to be evaluated for accuracy, repeatability and other requirements. The manufacturer states that the systems are currently approved for use in Germany and the United Kingdom.

At its September 2002 Annual Meeting, the WWMA recommended this item move forward as an information item.

At its October 2002 Annual Meeting, the Southern Weights and Measures Association (SWMA) recommended that this item move forward as an information item. Because the system uses compressed air to purge the delivery hose the SWMA has concerns with the repeatability and performance accuracy for the described system and does not support changing NIST Handbook 44 until the manufacturer provides performance data for consideration.

At the 2003 NCWM Interim Meeting, the Committee received a request from original submitter of the proposal to withdraw the item because they had encountered difficulty in collecting sufficient data to verify accuracy and repeatability of their system. The Committee agreed with the support of the committee representatives from the WWMA and the SWMA.

331-4 W S.3.2.X. Flood Volume Automatic Pump Discharge Unit

(This item was withdrawn.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Revise NIST Handbook 44, Section 3.31. by adding a Specification S.3.2.X. Flood Volume Automatic Pump Discharge Unit as follows:

S.3.2.X. Flood Volume Automatic Pump Discharge Unit. - When applicable, the volume of product necessary to flood the system when dry shall be clearly, conspicuously, and permanently marked on the system.

Discussion: A manufacturer of vehicle-tank metering put forth this proposal as part of its endeavor to have dry hose delivery systems recognized in NIST Handbook 44. The changes proposed to NIST Handbook 44 were believed necessary to allow the systems to begin the NTEP process. These systems would have had to be evaluated for accuracy, repeatability and other requirements. The systems are currently in use in Germany and the United Kingdom.

At its September 2002 Annual Meeting, the WWMA recommended this item move forward as an information item.

At its October 2002 Annual Meeting, the Southern Weights and Measures Association (SWMA) recommended that this item move forward as an information item. Because the system uses compressed air to purge the delivery hose the SWMA has concerns with the repeatability and performance accuracy for the described system and does not support changing NIST Handbook 44 until the manufacturer provides performance data for consideration.

At the 2003 NCWM Interim Meeting, the Committee received a request from original submitter of the proposal to withdraw the item because they had encountered difficulty in collecting sufficient data to verify accuracy and repeatability of their system. The Committee agreed with the support of the committee representatives from the WWMA and the SWMA.

331-5 VC UR.1.4. Liquid Measured

(This item was adopted.)

Source: Southern Weights and Measures Association (SWMA)

Recommendation: Revise NIST Handbook 44, Section 3.31 Vehicle-Tank Meters by adding a user requirement as follows:

UR.1.4. Liquid Measured. - A Vehicle-Tank Meter shall continue to be used to measure the same liquid or one with the same general physical properties as that used for calibration and weights and measures approval unless the meter is recalibrated with a different product and tested by a registered service agency or a weights and measures official and approved by the weights and measures jurisdiction having statutory authority over the device.

Discussion: At the October 2002 SWMA Annual Meeting, a weights and measures official stated that paragraph N.1. Test Liquid in the Vehicle-Tank Meters Code requires that a meter test be conducted with the same liquid or a liquid with the same general physical characteristics as the one being commercially measured. However there is no user requirement that requires the user to continue to use the product with which the meter was tested. The SWMA agreed that the issue has merit and recommended it be forwarded to the Committee as an information item.

At the 2003 NCWM Interim Meeting, the Committee received comments that the proposal should be modified to include testing and approval by weights and measures officials. The Committee agreed with the comments, modified the proposal, and decided to present it for a vote at the 2003 NCWM Annual Meeting as shown above.

At the 2003 NCWM Annual Meeting, the Meter Manufacturer's Association supported this item. The Committee heard that at their Spring 2003 Meetings, the Central Weights and Measures Association and the Northeastern Weights and Measures Association supported this item. NIST recommended that the title of the item be modified to be consistent with

terminology used in the paragraph title. The Committee agreed with WMD and modified the title of the item from “Test Liquid” to “Measured Liquid.”

331-6 I N.4.2. Special Tests (Except Milk-Measuring Systems), N.4.5. Product Depletion Test, and T.5. Product Depletion Test

Source: Northeastern Weights and Measures Association (NEWMA)

Recommendation: Modify NIST Handbook 44, Section 3.32. Vehicle-Tank Meters paragraph N.4.2. Special Tests (Except Milk-Measuring Systems) as follows:

N.4.2. Special Tests (Except Milk-Measuring Systems). - “Special” tests shall be made to develop the operating characteristics of a measuring system and any special elements and accessories attached to or associated with the device. Any test except as set forth in N.4.1. or N.4.5. shall be considered a special test. Special test of a measuring system shall be made as follows:

- (a) at a minimum discharge rate of 20 % of the marked maximum discharge rate or at the minimum discharge rate marked on the device whichever is less;
- (b) to develop operating characteristics of the measuring system ~~during a split-compartment delivery.~~

Add new paragraphs N.4.5. Product Depletion Test and T.5. Product Depletion Test to the Vehicle-Tank Meters Code as follows:

N.4.5. Product Depletion Test. - The effectiveness of the vapor eliminator shall be tested by depleting the product supply and continuing until the lack of fluid causes the meter register to stop completely. The test shall be completed by switching to another compartment with sufficient product on a multi-compartment vehicle, or by adding sufficient product to a single compartment vehicle. When adding product to a single compartment vehicle, allow appropriate time for any entrapped vapor to disperse before continuing the test.

T.5. Product Depletion Test. – The difference in the delivered volumes for the normal test and the product depletion test shall not exceed 0.5 % of the equivalent of one minute of flow at the maximum rated flow rate for the system.

Discussion: The proposal intends to recognize that the vapor measured when product is depleted during the vehicle-tank meter split compartment test (product depletion test) is a system problem that is not related to the prover size. The proposal requires a split compartment test (product depletion test) for single compartment vehicles to verify the performance of the air elimination mechanism.

At the 2003 NCWM Interim Meeting, the Committee agreed the proposal has merit because the product depletion test is necessary for vehicle-tank meters and the proposal provides guidelines on the appropriate test conditions. Therefore, the Committee changed the status of this item from developing to an information item. The proposed tolerance, when conducting a product depletion test, is based on the marked flow rate of the meter rather than the size of the prover. The tolerance stays the same regardless of the size of the prover used for the test. NEWMA noted concerns because operators with vehicle-tank meters that fail tests in a jurisdiction using a 100-gallon prover are passing tests in neighboring jurisdictions that use a 200-gallon prover.

The Committee is uncertain that all sizes of vehicle-tank meters can attain the 0.5 % tolerance proposed for the difference in the test results between the normal and product depletion tests. The Committee asks for data that demonstrates the ability of vehicle-tank meters to meet the proposed tolerance. The Committee also recommends NEWMA develop guidelines for switching tanks (compartments) when all tanks are not the same size to ensure an adequate test of the vehicle-tank meters since tanks of different sizes drain at different rates.

At the 2003 NCWM Annual Meeting, the Meter Manufacturer’s Association supported this item. The Committee heard that the NEWMA continues to support this item. NIST on noted that other tolerances such as repeatability tolerances that consider the difference between two or more tests also stipulate that all results must be within applicable tolerance. For consistency paragraph T.5. should be modified as follows:

T.5. Product Depletion Test. - The difference in the delivered volumes for the normal test and the product depletion test shall not exceed 0.5 % of the equivalent of one minute of flow at the marked maximum ~~rated flow~~ discharge rate for the system and all results must be within applicable tolerance.

The Committee agreed that this item should remain an information item to allow for additional development by the NTETC Measuring Sector and the regional weights and measures associations.

If you would like more information or to participate in test data collection contact Ross Andersen (New York Bureau of Weights and Measures) by telephone at 518-457-3146, by fax at 518-457-5693, or by email at ross.andersen@agmkt.state.ny.us or Stephen Martin (New York Bureau of Weights and Measures) by telephone at 315-487-2250, by fax at 315-487-2408, or by email at weighstyr@agmkt.state.ny.us.

332 LPG and Anhydrous Ammonia Liquid-Measuring Devices

332-1 VC Tolerances, Table T.2. Accuracy Classes for Section 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices

(This item was adopted.)

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Add a new Table T.2. to NIST Handbook 44, Section 3.32 LPG and Anhydrous Liquid-Measuring Devices and modify Paragraph T.2. as follows:

T.2. Tolerance Values. – The maintenance and acceptance tolerances for normal and special tests shall be as shown in Table T.2.

	Acceptance Tolerance	Maintenance Tolerance
Normal Tests	0.6%	1.0%
Special Tests	1.0%	1.0%

Table T.2. Accuracy Classes and Tolerances for LPG and Anhydrous Ammonia Liquid-Measuring Devices				
<u>Accuracy Class</u>	<u>Application</u>	<u>Acceptance Tolerance</u>	<u>Maintenance Tolerance</u>	<u>Special Test Tolerance*</u>
<u>1.0</u>	<u>Anhydrous ammonia, LPG gas (including vehicle tank meters)</u>	<u>0.6 %</u>	<u>1.0 %</u>	<u>1.0 %</u>
*where applicable				

Background/Discussion: At the 2002 NCWM Interim and Annual Meetings, the Committee received no negative comments on Item 330-3B.

Prior to the 2003 NCWM Interim Meeting, Item 330-3B was divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all NIST Handbook 44 Section 3, 3.3X - measuring device codes.

At its September 2002 Annual Meeting, the WWMA recognized that this format will facilitate the reformatting of NIST Handbook 44 and recommends that the Committee move it forward as a voting item.

At its October 2002 Interim Meeting, the Northeastern Weights and Measures Association (NEWMA) recommended that the Committee move this item forward as a voting item.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on the item.

At the 2003 NCWM Interim Meeting, the Committee heard that at their Spring 2003 Meetings, the Central Weights and Measures Association (CWMA) and NEWMA supported this item. WMD noted that in Handbook 44, liquefied petroleum gas is typically abbreviated as LPG and recommend that the use of the term be corrected from LP gas to LPG in the proposed Table T.2. The Committee agreed and modified Table T.2. as shown above.

For additional background on this Item see item 330-3B in the NCWM 2002 S&T Final Report.

332-2 I UR.2.3. Vapor-Return Line

Source: Carryover Item 332-2. (This item was developed by the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Modify NIST Handbook 44, Section 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices paragraph UR.2.3. as follows:

UR.2.3. Vapor Return Line. - During any metered delivery of liquefied petroleum gas from a supplier's tank to a receiving container, there shall be no vapor-return line from the receiving container to the supplier tank **except**:

- (a) in the case of any receiving container to which normal deliveries **cannot** be made without the use of such vapor-return line, or
- (b) in the case of any new receiving container when the ambient temperature is ~~below~~ **above** 90 °F, or **in the case of wholesale terminal deliveries.**
- (c) in the case of wholesale terminal deliveries.**

Background/Discussion: At its September 2001 Annual Meeting, the SWMA heard from the State of Tennessee that vapor-return lines are commonly used at LPG loading rack terminals where large capacity transports are loaded for distribution to bulk LPG dealers. At least some of the companies operating terminals are applying industry derived factors that are used to credit customers for metered product that is returned as vapor to the sellers' storage tanks. Paragraph U.R.2.3. (a) provides an exception for abnormal conditions, such as high pressure in the receiving tank, which prevents delivery without the use of a vapor return line. The SWMA questions whether or not bulk terminal locations fall under this exemption. The terminals where vapor-return lines are being used have insufficient pumping ability to fill the large vessels that are used to distribute LPG to bulk dealer facilities; however, when pumping capacity becomes an issue the condition can be remedied by installing new pumping and metering equipment which is capable of filling the large pressure vessels without a vapor-return line. Additionally, the terminals have the option of weighing the product rather than metering it. These conditions exist at LPG terminals in all regions of the United States, thus, this is not a unique situation only affecting Tennessee.

SWMA agreed with Tennessee that the following points should be reviewed to remove any ambiguity about the appropriateness of vapor return lines in various LPG filling operations:

1. Allow loading rack terminals to use vapor-return lines and review a proposal from industry on applying the vapor factor to credit the purchaser. A mean credit value may be adequate, although it has been determined that the vapor returned is not always consistent from delivery to delivery.
2. Allow a vapor meter to be installed between the receiving vessel and the seller's tanks, then convert the vapor measurements to liquid quantities and credit the purchaser.
3. Provide a consensus opinion that bulk terminal loading-rack installations meet the exception contained in paragraph UR.2.3. (a) and no action is needed by weights and measures officials.

4. Provide a consensus opinion that the conditions do not meet the exception noted in paragraph UR.2.3. and weights and measures official should require terminals currently unable to load without vapor-return lines to take corrective action to comply with NIST Handbook 44.

The SWMA recognized the State of Tennessee's concerns of the and agreed to forward this item to NCWM, but recommends it remain informational to allow Tennessee to develop specific language.

At the 2002 NCWM Interim and Annual Meetings, the Committee gave the item informational status to provide Tennessee time to develop a specific proposal.

Following the 2003 NCWM Interim Meeting, the Committee received the proposal shown in the recommendation above from the State of Tennessee. The Committee agreed the item should remain informational to provide the regional associations an opportunity to review and discuss Tennessee's proposal.

At the 2003 NCWM Annual Meeting, Tennessee recommended that for clarity the last sentence in the original proposal should be made a separate paragraph (c). The Committee agreed and modified the original proposal as shown above. The Committee agreed that the item should remain an information item to provide for additional review and input from industry and the regional weights and measures associations.

333 Hydrocarbon Gas Vapor-Measuring Devices

333-1 VC Tolerances, Table T.1. Accuracy Classes for Section 3.33. Hydrocarbon Gas Vapor-Measuring Devices

(This item was adopted)

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Add a new Table T.1. to NIST Handbook 44, Section 3.33 Hydrocarbon Gas Vapor-Measuring Devices and modify Paragraph T.1. as follows:

T.1. Tolerance Values on Normal Tests and on Special Tests Other Than Low-Flame Tests. - Maintenance and acceptance tolerances for normal and special tests for hydrocarbon gas vapor-measuring devices shall be as shown in Table T.1. ~~3 percent (1.03 proof) of the test draft on underregistration and 1.5 percent (0.985 proof) of the test draft on overregistration.~~
(Amended 1981and 200X)

Table T.1. Accuracy Classes and Tolerances or Hydrocarbon Gas Vapor-Measuring Devices				
<u>Accuracy Class</u>	<u>Application</u>		<u>Acceptance Tolerance</u>	<u>Maintenance Tolerance</u>
<u>3.0</u>	<u>Gases at low pressure (LPG vapor)</u>	<u>Overregistration</u>	<u>1.5 %</u>	<u>1.5 %</u>
		<u>Underregistration</u>	<u>3.0 %</u>	<u>3.0 %</u>

Background/Discussion: At the 2002 NCWM Interim and Annual Meetings, the Committee received no negative comments on Item 330-3B.

Prior to the 2003 NCWM Interim Meeting, Item 330-3B was divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all NIST Handbook 44 Section 3, 3.3X - measuring device codes.

At its September 2002 Annual Meeting the WWMA recognized that this format will facilitate the reformatting of NIST Handbook 44 and recommended that the Committee move it forward as a voting item.

At its October 2002 Interim Meeting the Northeastern Weights and Measures Association (NEWMA) recommended that the Committee move this item forward as a voting item.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on this item and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

At the 2003 NCWM Interim Meeting, the Committee learned that the Central Weights and Measures Association (CWMA) and NEWMA supported this item. WMD noted that in Handbook 44, liquefied petroleum gas is typically abbreviated as LPG and recommend that the use of the term be corrected from LP to LPG in the proposed Table T.1. The Committee agreed and modified Table T.1. as shown above.

For additional background on this item see Item 330-3B in the NCWM 2002 S&T Final Report.

334 Cryogenic Liquid-Measuring Devices

334-1 VC Tolerances; T.2. Tolerance Values, T.2.1. On Normal Tests, T.2.2. On Special Tests and Table T.2. Accuracy Classes for Section 3.34. Cryogenic Liquid-Measuring Devices

(This item was adopted)

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Add a new Table T.2. to NIST Handbook 44, Section 3.34 Cryogenic Liquid-Measuring Devices delete paragraphs T.2.1. and T.2.2. and modify Paragraph T.2. as follows:

T.2. Tolerance Values. - The maintenance and acceptance tolerances for normal and special tests shall be as shown in Table T.2.

~~**T.2.1. On Normal Tests. - The maintenance tolerance on "normal" tests shall be two and one half percent (2.5 %) of the indicated quantity. The acceptance tolerance shall be one and one half percent (1.5 %) of the indicated quantity.**~~

~~**T.2.2. On Special Tests. - The maintenance and acceptance tolerance on "special" tests shall be two and one half percent (2.5 %) of the indicated quantity.**~~

<u>Table T.2. Accuracy Classes and Tolerances for Cryogenic Liquid-Measuring Devices</u>				
<u>Accuracy Class</u>	<u>Application</u>	<u>Acceptance Tolerance</u>	<u>Maintenance Tolerance</u>	<u>Special Test Tolerance*</u>
<u>2.5</u>	<u>Cryogenic products; liquefied compressed gases other than LP gas liquid carbon dioxide</u>	<u>1.5 %</u>	<u>2.5 %</u>	<u>2.5 %</u>
*where applicable				

Background/Discussion: At the 2002 NCWM Interim and Annual Meetings, the Committee received no negative comments on Item 330-3B.

Prior to the 2003 NCWM Interim Meeting, Item 330-3B was divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all Handbook 44 Section 3, 3.3X -measuring device codes.

At its September 2002 Annual Meeting, the WWMA recognized that this format will facilitate the reformatting of NIST Handbook 44 and recommended that the Committee move it forward as a voting item.

At its October 2002 Interim Meeting, the Northeastern Weights and Measures Association (NEWMA) recommended that the Committee move this item forward as a voting item.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on this item and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

At the 2003 NCWM Interim Meeting, the Committee heard that at their Spring 2003 Meetings, the Central Weights and Measures Association (CWMA) and NEWMA supported this item. WMD noted that LP gas is not a cryogenic liquid. The only cryogenic product presently covered by a separate code is liquid carbon dioxide. WMD recommended that the reference to LP gas in the proposed Table T.2. be replaced with a reference to liquid carbon dioxide. The Committee agreed and modified Table T.2. as shown above.

For additional background on this item see item 330-3B in the NCWM 2002 S&T Final Report.

334-2 VC Definition of Cryogenic Liquid-Measuring Devices

(This item was adopted)

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Modify the NIST Handbook 44 definition for cryogenic liquid-measuring device as follows.

cryogenic liquid-measuring device. A system including a liquid-measuring element ~~mechanism or machine of (a) the meter of the positive displacement, turbine, or mass flow type, or (b) a weighing type of device mounted on a vehicle,~~ designed to measure and deliver cryogenic liquids in the liquid state. Means may be provided to indicate automatically, for one of a series of unit prices, the total money value of the liquid measured.[3.34] (Amended 1986, 200X)

Background/Discussion: In 1986, paragraph A.1. of Section 3.34. Cryogenic Liquid-Measuring Devices and the definition for cryogenic liquid-measuring devices were modified to include on-board-weighing systems for measuring cryogenic liquid. In 1995 the reference to scales for measuring cryogenic liquids was removed from paragraph A.1., because vehicle on-board weighing systems were recognized in the Scales Code in 1992. At its October 2002 Meeting, the NTETC Measuring Sector recognized that the reference to scales for measuring cryogenic liquids was not removed from the definition for cryogenic liquid-measuring device in 1995 and recommended that the definition be modified to reflect the 1995 change to paragraph A.1.

At its October 2002 Annual Meeting, the Southern Weights and Measures Association supported the proposal and recommended that the Committee move it forward as a voting item.

At the 2003 NCWM Interim and Annual Meetings, the Committee received no comments on this item and agreed to present it for a vote.

335 Milk Meters**335-1 W Tolerances; Table T.X. Accuracy Classes for Section 3.35. Milk Meters**

(This item was withdrawn)

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Add the following new Table T.X. for Liquid-Measuring Devices to NIST Handbook 44, Sections 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices, 3.33. Hydrocarbon Gas Vapor-Measuring Devices, 3.34. Cryogenic Liquid-Measuring Devices, 3.35. Milk Meters, 3.36. Water Meters, 3.37. Mass Flow Meters, and 3.38. Carbon Dioxide Liquid-Measuring Devices. As an option the entire table could be added as an appendix to these codes.

Table T.X Accuracy Classes for Liquid Measuring Devices Covered in NIST Handbook 44 Sections 3.32 through 3.38					
Accuracy Class	Application		Acceptance Tolerance	Maintenance Tolerance	Special Test Tolerance*
1.0	Anhydrous ammonia, LP gas (including vehicle tank meters)		0.6 %	1.0 %	1.0 %
1.5	Water	Overregistration	1.5 %	1.5 %	1.5 %
		Underregistration	1.5 %	1.5 %	5.0 %
2.0	Compressed natural gas as a motor fuel		1.5 %	2.0 %	2.0 %
2.5	Cryogenic products; liquefied compressed gases other than LP gas		1.5 %	2.5 %	2.5 %
3.0	Gases at low pressure (LP vapor)	Overregistration	1.5 %	1.5 %	
		Underregistration	3.0 %	3.0 %	
*where applicable					

Background/Discussion: At the 2002 NCWM Annual Meeting, the Committee received no negative comments on item 330-3B. The Committee made item 330-3B informational to allow further study on the effect of the proposed tolerances for devices covered by Section 3.32. through Section 3.38.

Item 330-3B was divided into a separate item for each affected Handbook 44 code. The tolerances shown in the proposed table are the same as the current tolerances. The proposed table format will facilitate the reformatting of all Handbook 44 Section 3, 3.3X -measuring device codes.

Following the 2002 NCWM Annual Meeting, NIST noted that proposed table above does not include a specific class designation and tolerances for devices measuring milk as it does for devices measuring other commodities. When Table T.1. for Section 3.31. Vehicle-Tank Meters was adopted in 2002, Table 2. Tolerances for Vehicle-Mounted Milk Meters was not deleted from the code. The existing Table 1. Tolerances for Milk Meters and Table 2. Tolerances for Vehicle-Mounted Milk Meters provide the same tolerances for both applications. If Table 2. Tolerances for Milk Meters is to be replaced with a table providing an accuracy class and tolerances for milk meters, then a class designation and an appropriate percent tolerance need to be developed.

At its September 2002 Annual Meeting, the WWMA agreed that the above table does not include tolerances for milk meters. No specific proposal recommending a single percentage tolerance for milk meters was available for review. The WWMA recommends that this item remain an information item until a specific proposal is submitted for consideration.

At the 2003 NCWM Interim Meeting, the Committee agreed that the current Table 1. Tolerances for Milk Meters in the milk meters code should be retained to be consistent with the milk meter tolerances in the vehicle-tank meters code. The Committee agreed to withdraw this item from its agenda.

For additional background on this item see item 330-3B in the NCWM 2002 S&T Final Report.

336 Water Meters

336-1 V Tolerances; N.3. Test Drafts, N.4.1. Normal Tests, N.4.2. Special Tests, T.1. Tolerance Values, Table N.4.1. Flow Rate and Draft Size for Water Meters Normal Tests, Table N.4.2. Flow Rate and Draft Size for Water Meters Special Tests, and Table T.1. Accuracy Classes for Section 3.36. Water Meters

(This item was adopted)

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Modify NIST Handbook 44, Section 3.36 Water Meters paragraphs N.3., N.4.1., N.4.2., and T.1. delete existing Table 1 and Table 2., add new Tables N.4.1., and N.4.2. as shown below.

N.3. Test Drafts. - Test drafts should be equal to at least the amount delivered by the device in 2 minutes and in no case less than the amount delivered by the device in 1 minute at the actual maximum flow rate developed by the installation. The test drafts shown in Table N.4.1., next page, shall be followed as closely as possible.

N.4. Testing Procedures.

N.4.1. Normal Tests. - The normal test of a meter shall be made at the maximum discharge rate developed by the installation. Meters with maximum gallon per minute ratings higher than Table N.4.1. values may be tested up to the meter rating, with meter indications no less than those shown.
(Amended 1990 and 2002)

N.4.1.1. Repeatability Tests. - Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors, such as temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained.
(Added 2002)

N.4.2. Special Tests. - Special tests to develop the operating characteristics of meters may be made according to the rates and quantities shown in Table N.4.2.

T.1. Tolerance Values. - Maintenance and acceptance tolerance shall be as shown in Table T.1. and ~~Table 2.~~

Table 1. Tolerances for Water Meters Normal Tests				
Meter size (inches)	Rate of flow (gal/min)	Maximum Rate		
		Meter indication		Tolerance on over- and under- registration
		gal	ft ³	
Less than 5/8	8	50	5	1.5 %
5/8	15	50	5	
3/4	25	50	5	
1	40	100	10	
1 1/2	80	300	40	
2	120	500	40	
3	250	500	50	
4	350	— 1 000	100	
6	700	— 1 000	100	

Table 2. Tolerances for Water Meters Special Tests									
Meter size (inches)	Intermediate Rate				Minimum Rate				
	Rate of flow (gal/min)	Meter indication		Tolerance on over and under-registration	Rate of flow (gal/min)	Meter indication		Tolerance	
		gal	ft ³			gal	ft ³	Under-registration	Over-registration
Less than or equal to 5/8	2	10	1	1.5 %	1/4	5	1	5.0 %	1.5 %
3/4	3	10	1		1/2	5	1		
1	4	10	1		3/4	5	1		
1 1/2	8	50	5		1 1/2	10	1		
2	15	50	5		2	10	1		
3	20	50	5		4	10	1		
4	40	100	10		7	50	5		
6	60	100	10		12	50	5		

Table N.4.1. Flow Rate and Draft Size for Water Meters Normal Tests			
Meter size (inches)	Rate of flow (gal/min)	Maximum Rate	
		Meter Indication/Test Draft	
		Gal	ft ³
Less than 5/8	8	50	5
5/8	15	50	5
3/4	25	50	5
1	40	100	10
1 1/2	80	300	40
2	120	500	40
3	250	500	50
4	350	1 000	100
6	700	1 000	100

Table N.4.2. Flow Rate and Draft Size for Water Meters Special Tests						
Meter size (inches)	Intermediate Rate			Minimum Rate		
	Rate of flow (gal/min)	Meter indication/Test Draft		Rate of flow (gal/min)	Meter indication/Test Draft	
		gal	ft³		gal	ft³
Less than or equal to 5/8	2	10	1	1/4	5	1
3/4	3	10	1	1/2	5	1
1	4	10	1	3/4	5	1
1 1/2	8	50	5	1 1/2	10	1
2	15	50	5	2	10	1
3	20	50	5	4	10	1
4	40	100	10	7	50	5
6	60	100	10	12	50	5

Table T.1. Accuracy Classes and Tolerances for Water Meters					
Accuracy Class	Application		Acceptance Tolerance	Maintenance Tolerance	<u>Tolerance for Special Tests Conducted at the Minimum Flow Rate Tolerances*</u>
1.5	Water	Overregistration	1.5 %	1.5 %	1.5 %
		Underregistration	1.5 %	1.5 %	5.0 %
*where applicable					

Background/Discussion: At the 2002 NCWM Interim and Annual Meetings, the Committee received no negative comments on Item 330-3B.

Prior to the 2003 NCWM Interim Meeting, Item 330-3B was divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all NIST Handbook 44 Section 3, 3.3X - measuring device codes.

At its September 2002 Annual Meeting, the WWMA supported the concept of having accuracy classes and tolerances in a uniform table format for all Section 3, 3.3X -measuring device codes; however, the existing Table 1 and Table 2 in the Water Meters Code include criteria for test draft sizes and for maximum, intermediate, and minimum flow rates for testing various sizes of water meters. The test draft size and flow rate information in Table 1 and Table 2 needed to be retained. The WWMA recommended that this item remain informational until a proposal to retain the flow rate criteria to accompany the new table for accuracy class and tolerances is developed.

At the 2003 NCWM Interim Meeting, the Committee and the technical advisors developed new test notes and tables to replace the current Table 1 and Table 2 to retain test recommendations for flow rate and draft size. The Committee agreed to present the item for a vote at the 2003 NCWM Annual Meeting.

At the 2003 NCWM Annual Meeting, the California Division of Measurement Standards (DMS) provided editorial comments on this item to the committee. The modified paragraph T.1. and the tables 1 and 2 proposed for deletion were not included in the item as presented in Publication 16. DMS also recommended that the footnote in Table T.1. be changed from "where applicable" to "Only applies to Minimum Rate of Flow Tests." The Committee agreed that while other types of tests could be considered "special tests", as presently written, in Handbook 44 Section 3.36. Water Meters,

tests conducted at minimum flow rates are the only tests where “special test” tolerances apply. The Committee modified the proposal as shown above.

For additional background on this item see Item 330-3B in the NCWM 2002 S&T Final Report.

336-2 V S.2.3. Multi-Jet Meter Identification, Table T.1. Accuracy Classes and Tolerances for Water Meters; Other than Multi-Jet Meters and Special Tests at the Minimum Flow Rate, and Appendix D; Definition of Multi-Jet Water Meter

(This item was adopted)

Source: Western Weights and Measure Association (WWMA)

Recommendation: Add a new paragraph S.2.3 to NIST Handbook 44, Section 3.36 Water Meters, and modify Table T.1. (as proposed in item 336-1) as follows:

S.2.3. Multi-Jet Meter Identification. – Multi-Jet water meters shall be clearly and permanently identified as such on the device or on the Certificate of Conformance.

Table T.1. Accuracy Classes and Tolerances for Water Meters					
Accuracy Class	Application		Acceptance Tolerance	Maintenance Tolerance	<u>Tolerance for Special Tests Conducted at the Minimum Flow Rate Tolerances</u> [‡]
1.5	<u>Water other than Multi-Jet</u>	Overregistration	1.5 %	1.5 %	1.5 %
		Underregistration	1.5 %	1.5 %	5.0 %
1.5	Water Multi-jet	Overregistration	1.5 %	1.5 %	3.0 %
		Underregistration	1.5 %	1.5 %	3.0 %
‡where applicable					

Add a new definition to Appendix D:

Multi-Jet Water Meter. A water meter in which the moving element takes the form of a multiblade rotor mounted on a vertical spindle within a cylindrical measuring chamber. The liquid enters the measuring chamber through several tangential orifices around the circumference and leaves the measuring chamber through another set of tangential orifices placed at a different level in the measuring chamber. These meters register by recording the revolutions of a rotor set in motion by the force of flowing water striking the blades. [3.36]

Discussion: Currently, the Water Meters code does not include any test criteria or tolerances for multi-jet water meters. Multi-jet meters are widely used for metering and sub-metering water. One manufacturer of these meters indicates that the performance curve for a multi-jet meter is different than the performance curve for a positive displacement meter and believes that the tolerances for a multi-jet meter should be equal for underregistration and overregistration at all flow rates. The American Water Works Association (AWWA) has recognized these differences and has developed two standards, C700-02: Cold-Water Meters – Displacement Type, Bronze Main Case and C708-96: Cold-Water Meters – Multijet Type, to allow for the different meter accuracy curves.

At its September 2002 Annual Meeting, the WWMA agreed that test criteria and tolerances for multi-jet water meters should be included in the water meters code and agreed to forward it to the Committee as an information item.

At the 2003 NCWM Interim Meeting, the Committee and the technical advisors developed a new tolerance table T.1. based on the table proposed in item 336-1 that includes tolerances for multi-jet water meters to replace the ones proposed by WWMA which do not follow the new format proposed for all liquid-measuring device codes. The Committee agreed to present the item for a vote at the 2003 NCWM Annual Meeting.

At the 2003 NCWM Annual Meeting, the California Division of Measurement Standards (DMS) provided editorial comments on this item similar to those provided for item 336-1. The Northeastern Weights and Measures Association (NEWMA) stated that the any markings identifying the meter, as being a Multi-Jet Meter, should be on the meter itself. The Committee agreed with DMS and the NEWMA and modified the proposal as shown above.

338 Carbon Dioxide Liquid-Measuring Devices

338-1 VC Tolerances; T.2. Tolerance Values, T.2.1. On Normal Tests, T.2.2. On Special Tests, and Table T.2. Accuracy Classes for Section 3.38. Carbon Dioxide Liquid-Measuring Devices

(This item was adopted)

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Add a new Table T.2., to NIST Handbook 44, Section 3.38 Carbon Dioxide Liquid-Measuring Devices modify Paragraph T.2. and delete paragraphs T.2.1. and T.2.2. as follows:

T.2. Tolerance Values. - The maintenance and acceptance tolerances for normal and special tests shall be as shown in Table T.2.

~~**T.2.1. On Normal Tests.** The maintenance tolerance on "normal" tests shall be two and one half percent (2.5 %) of the indicated quantity. The acceptance tolerances shall be one and one half percent (1.5 %) of the indicated quantity.~~

~~**T.2.2. On Special Tests.** The maintenance and acceptance tolerance on "special" tests shall be two and one half percent (2.5 %) of the indicated quantity.~~

Table T.2. Accuracy Classes and Tolerances for Carbon Dioxide Liquid-Measuring Devices				
Accuracy Class	Application	Acceptance Tolerance	Maintenance Tolerance	Special Test Tolerance*
2.5	<u>Liquid carbon dioxide</u> Cryogenic products; liquefied compressed gases other than LP gas	1.5 %	2.5 %	2.5 %
*where applicable				

Background/Discussion: At the 2002 NCWM Interim Meeting, the Committee agreed with the WWMA recommendation to split item 330-1 into items 330-3A and 330-3B. The Committee also made item 330-3B informational to allow further study on the effect of the proposed tolerances for devices covered by Section 3.32. through Section 3.38. The background and rational for this item are outlined in the 2002 NCWM S&T Agenda Item 330-3A and 331-1 that address the proposed changes to Sections 3.30 and 3.31.

At the 2002 NCWM Annual Meeting, the Committee received no negative comments on this item.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on this item and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

At the 2003 NCWM Interim and Annual Meetings, the Committee heard no negative comments on this item. WMD noted that Liquid Carbon Dioxide is the only product covered by this table and recommended that the reference to liquefied compressed gases other than LP gas be removed. The committee agreed and modified the table as shown above.

356(a) Grain Moisture Meters

356(a)-1 VC Recognize Indications and Recorded Representations of Test Weight per Bushel

(This item was adopted.)

Source: This item originated from the National Type Evaluation Technical Committee (NTETC) Grain Moisture Meter (GMM) Sector and first appeared on the S&T Committee's 2000 agenda as Developing Item 360-3, Appendix D.

Recommendation: Modify NIST Handbook 44 Section 5.56(a) Grain Moisture Meters Code to recognize indications and recorded representation of test weight per bushel as follows:

Amend the following paragraphs:

A.1. - This code applies to grain moisture meters; that is, devices used to indicate directly the moisture content of cereal grain and oil seeds. The code consists of general requirements applicable to all moisture meters and specific requirements applicable only to certain types of moisture meters. Requirements cited for "test weight per bushel" indications or recorded representations are applicable only to devices incorporating an automatic test weight per bushel measuring feature.

S.1.1. Digital Indications and Recording Elements.

- (c) Meters shall be equipped with a communication interface that permits interfacing with a recording element and transmitting the date, grain type, grain moisture results, test weight per bushel results and calibration version identification.
- (d) A digital indicating element shall not display and a recording element shall not record any moisture content values or test weight per bushel values before the end of the measurement cycle.
- (e) Moisture content results shall be displayed and recorded as percent moisture content, wet basis. Test weight per bushel results shall be displayed and recorded as pounds per bushel. Subdivisions of ~~this~~ these units shall be in terms of decimal subdivisions (not fractions).
- (f) A meter shall not display or record any moisture content or test weight per bushel values when the moisture content of the grain sample is beyond the operating range of the device, unless the moisture and test weight representations includes a clear error indication (and recorded error message with the recorded representations).

S.1.3. Operating range. - A meter shall automatically and clearly indicate when the operating range of the meter has been exceeded. The operating range shall specify the following:

- (c) **Moisture Range of the Grain or Seed.** The moisture range for each grain or seed for which the meter is to be used shall be specified. ~~A moisture and test weight per bushel values~~ may be displayed when the moisture range is exceeded if accompanied by a clear indication that the moisture range has been exceeded.

S.1.4. Value of Smallest Unit. - The display shall permit ~~constituent~~ moisture value determination to both 0.01 % and 0.1 % resolution. The 0.1 % resolution is for commercial transactions; the 0.01 % resolution is for type evaluation and calibration purposes only, not for commercial purposes. Test weight per bushel values shall be determined to the nearest 0.1 pound per bushel.

S.2.4.1. Calibration Version. - A meter must be capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number for use in verifying that the latest version of the calibration is being used to make moisture content and test weight per bushel determinations.

S.2.6. Determination of Quantity and Temperature. - The moisture meter system shall not require the operator to judge the precise volume or weight and temperature needed to make an accurate moisture determination. External grinding, weighing, and temperature measurement operations are not permitted. In addition, if the meter is capable of measuring test weight per bushel, determination of sample volume and weight for this measurement shall be fully automatic and means shall be provided to ensure that measurements of test weight per bushel are not allowed to be displayed or printed when an insufficient sample volume is available to provide an accurate measurement.
[Nonretroactive as of January 1, 2004]

S.4. Operating Instructions and Use Limitations. - The manufacturer shall furnish operating instructions for the device and accessories that include complete information concerning the accuracy, sensitivity, and use of accessory equipment necessary in obtaining a moisture content. Operating instructions shall include the following information:

(d) the kind or classes of grain or seed for which the device is designed to measure moisture content and test weight per bushel;

N.1.1. ~~Air Oven Reference Method~~ Transfer Standards. - Official grain samples shall be used as the official transfer standards with moisture content and test weight per bushel. Moisture content values are assigned by the reference methods. The reference methods for moisture shall be the oven drying methods as specified by the USDA GIPSA. The test weight per bushel value assigned to a test weight transfer standard shall be the average of 10 test weight per bushel determinations using the quart kettle test weight per bushel apparatus as specified by the USDA GIPSA. Tolerances shall be applied to the average of at least three measurements on each official grain sample. Official grain samples shall be clean and naturally moist, but not tempered (i.e., water not added).

N.1.2. Minimum Test. - A minimum test of a grain moisture meter shall consist of tests:

~~(a) with~~ using samples (need not exceed three) of each grain or seed type for which the device is used, and for each grain or seed type shall include the following:

(a) tests of moisture indications, ~~(b)with~~ using samples having at least two different moisture content values within the operating range of the device, and if applicable,

(b) tests of test weight per bushel indications, with at least the lowest moisture samples used in (a) above.

T.3. For Test Weight Per Bushel Indications or Recorded Representations. - The maintenance and acceptance tolerances on test weight per bushel indications or recorded representations shall be ~~0.193 kg/hL or 0.15 lb/bu.~~ The test methods used shall be those specified by the USDA GIPSA, as shown in Table T.3. Tolerances are (+) positive or (-) negative with respect to the value assigned to the official grain sample.

<u>Table T.3. Acceptance and Maintenance Tolerances Test</u>	
<u>Weight per Bushel</u>	
<u>Type of Grain or Seed</u>	<u>Tolerance</u> <u>(pounds per bushel)</u>
<u>Corn, oats</u>	<u>0.8</u>
<u>All wheat classes</u>	<u>0.5</u>
<u>Soybeans, barley, rice,</u> <u>sunflower, sorghum</u>	<u>0.7</u>

UR.1.1. Value of the Smallest Unit on Primary Indicating and Recording Elements. - The resolution of the moisture meter display shall be 0.1 % moisture and 0.1 pounds per bushel test weight during commercial use.

UR.3.4. Printed Tickets

- (b) The customer shall be given a printed ticket showing the date, grain type, grain moisture results, test weight per bushel and calibration version identification. The ticket shall be generated by the grain moisture meter system.**

Discussion: This proposal was developed to provide tolerances and to establish requirements for specific grain types to address grain moisture meters with an optional automatic test weight per bushel (TW) measuring feature.

The following information is excerpted from the 2002 Grain Moisture Meter (GMM) Sector summary. Knowledge of Test Weight per Bushel (TW) is important not only in determining the price a producer receives for grain delivered to a grain elevator; it is also important to the grain elevator when grain stocks in storage are audited for quantity. Grain industry members reported that the proposed tolerances for TW are acceptable to the industry. Stressing that the grain industry urgently needs the capability to simultaneously (and easily) make TW determinations, they urged the GMM Sector to move forward on this issue. Some members were hesitant about moving forward at that time, citing concern about the unresolved issue of large negative bias in the Phase II data for one state. A review of the issue strongly indicates a procedural error at the field level was the cause for questionable data. It was pointed out that even if the GMM Sector recommends moving ahead at this time, the earliest date that changes in the code would become effective was January 1, 2004.

The GMM Sector considered whether the recommended changes should be retroactive or nonretroactive. Sector discussions centered on the requirement that meters measuring TW must provide some means to ensure that measurements of TW are not allowed to be displayed or printed when insufficient sample volume has been supplied. The GMM Sector recognized there is a general assumption that the means will include some sort of a level sensor installed in either the sample hopper or the test cell although the proposed code does not specify how this will be accomplished.

GMM Sector members in favor of making the proposed code retroactive noted that although moisture measurements are not significantly affected when samples are not of sufficient size to completely fill the measuring cell of a GMM, the TW measurement is greatly affected when the cell is not filled. Measurement of TW requires determination of two parameters; volume and mass. The vast majority of GMMs with TW capability presently in the field do not have means to assure that the measuring cell is completely full. If the cell is not filled completely, TW indications will be lower than they should be to the disadvantage of the producer selling grain. Some members in favor of making the code nonretroactive felt that GMMs with a window, through which the test cell could be seen, provide adequate means to verify that the cell is full. A grain industry member expressed the belief that compared to how test weight measurements are being made now, the worry about a sensor was trivial. It was argued that as long as the GMM could produce an accurate TW measurement when properly used, it was not important whether or not the hopper or test cell had a sensor. Some thought this was a facilitation of fraud issue and favored making the sensor requirement retroactive. Other members thought that making the code retroactive would unfairly penalize users of existing NTEP meters with TW capability.

One manufacturer supported making the sensor requirement retroactive and pointed out that the GMMs they manufacture are covered by an NTEP Certificate of Conformance (CC) and are hard coded to add the words “approx” or “approximate” to the display and print out TW measurements. That GMM Sector member also questioned how devices displaying “approximate” TW would be regulated if the sensor requirement was nonretroactive. Weights and measures officials were at first divided on this question. Some were of the opinion that they would permit the continued use of the device and display of “approximate” TW, if the device met the tolerance requirements, since “approximate” was added at the request of jurisdictions permitting a display of TW when tolerances did not exist as regulation. Others were concerned about what would happen in a court case when printed tickets which recorded “approximate” were used as evidence. States that presently do not permit “approximate” TW to be displayed or recorded indicated they would not change their policy.

The Committee discussed concerns about how to ensure meters have sufficient sample volume. The Committee was informed that older meters are equipped with a hopper where the operator can observe the sample volume; however, most new meters do not have a weight sensor. The GMM Sector agreed that the proposed changes to paragraph S.2.6. to require a means for sensing when a sample is not sufficient should be a nonretroactive requirement. The Committee agreed that all issues were resolved and the item is ready for a vote at the 2003 NCWM Annual Meeting.

The Committee considered a proposal to include SI (metric) units of measurement in paragraphs S.1.1.(e), S.1.4., and UR.1.1. and Table T.3. The Committee believes that grain moisture meters currently recognized in the United States indicate and make measurements only in U.S. customary units. Prior to any editorial changes, the Committee asked that NIST determine if including metric units involves straight conversions or other steps. The advisors determined that a straight measurement unit conversion of lb/bu test weight to kg/hL using the USDA method does not equal the method followed by countries using the metric system, where kg/hL is based on the ISO test method.

The Committee also discussed the use of term “approximate” TW (test weight per bushel). The Committee agreed that quantifying terms should not be used in conjunction with indicated or recorded units of measurement.

356(b) Grain Moisture Meters

356(b)-1 VC T.3. For Separate Test Weight Per Bushel Devices

(This item was adopted.)

Source: Central Weights and Measures Association (CWMA)

Recommendation: Modify paragraph T.3. as follows:

T.3. For Separate Test Weight Per Bushel Devices ~~Indications or Recorded Representations.~~ - The maintenance and acceptance tolerances on separate test weight per bushel devices used to determine the test weight per bushel of grain samples for the purpose of making density corrections in moisture determinations ~~indications or recorded representations~~ shall be 0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA GIPSA using a dockage-free sample of dry hard red winter wheat.

Discussion: Prior to being amended in 1992, Section 5.56.(b) applied to separate test weight per bushel (TW) devices used to determine the test weight per bushel of grain samples for the purpose of making density corrections in moisture determinations. When grain moisture meters were introduced with the capability to automatically indicate and record test weight per bushel values for the grain sample under test for moisture, the paragraph was amended to cover these devices. The tolerance assigned was that used by USDA GIPSA for their quart kettle test weight per bushel apparatus when tested as specified in the USDA GIPSA procedures using samples of hard red winter wheat.

At its August 2002 meeting, the Grain Moisture Meter (GMM) Sector reviewed test weight per bushel data collected in a field evaluation of the proposed tolerances and test methods. The GMM Sector agreed to recommend that only Section 5.56.(a) of the Grain Moisture Meter Code recognize indications and recorded representations in weight per bushel for a vote at the 2003 NCWM Annual Meeting. New devices with test weight per bushel capability will be required to be fully automatic and have means to ensure that measurements of test weight per bushel are not allowed to be displayed or printed when insufficient sample volume is available.

The GMM Sector decided that it was not appropriate for the Sector to recommend modification of Section 5.56.(b) of the Code to add tolerances for grain moisture meters with test weight per bushel capability. Non-NTEP devices with test weight per bushel capability will not be required to determine if a sufficient sample volume has been provided for an accurate measurement. Section 5.56.(b) applies to non-NTEP devices which are not within the purview of the GMM Sector. Weights and Measures officials who are GMM Sector members suggested that paragraph T.3. should be revised to clarify that it applies to separate accessory devices (such as a beam balance test weight apparatus) used to determine test weight per bushel of grain samples for the purpose of making density corrections in moisture determinations. The Committee modified the paragraph title to clarify that the tolerance applies to separate equipment used to determine the TW that is used to make density correction in moisture determinations rather than grain moisture meters.

The Committee heard no unfavorable comments on this item. Therefore, the Committee recommended the item for a vote at the 2003 NCWM Annual Meeting.

357 Near-Infrared Grain Analyzers

357-1 VC S.1.1. Digital Indications and Recording Elements

(This item was adopted.)

Source: National Type Evaluation Technical Committee (NTETC) Near Infrared Grain Analyzer (NIR) Sector

Recommendation: Modify paragraphs S.1.1.(c) and (e) as follows:

S.1.1. Digital Indications and Recording Elements.

- (c) *Analyzers shall be equipped with a communication interface that permits interfacing with a recording element and transmitting the date, grain type or class, constituent values, the moisture basis for each constituent value (except moisture), and calibration version identification. If the analyzer converts constituent results to a manually entered moisture basis, the “native” concentration and the “native” moisture basis must appear on the printed ticket in addition to the converted results and the manually entered moisture basis.*
- (e) *Constituent content shall be recorded and displayed as percent of total mass at the specified moisture basis. The moisture basis shall also be recorded and displayed for each constituent content result (except moisture). If a whole grain analyzer that is calibrated to display results on an “as is” moisture basis does NOT display or record a moisture value, it must clearly indicate that results are expressed on an “as is” moisture basis. Ground grain analyzers must ALWAYS display and record a moisture measurement for “as is” content results (except moisture).*

Add new paragraph S.1.1.(h) as follows:

- (h) If the analyzer incorporates a built-in printer or if a printer is available as an accessory to the analyzer, the information appearing on the printout shall be arranged in a consistent and unambiguous manner.**

Discussion: During its August 2002 review of NCWM Publication 14 checklist to add additional grains and criteria for moisture basis, the NIR Sector considered including text, “at the specified moisture basis,” to the NTEP Publication 14 criteria that is based on NIST Handbook 44 paragraph S.1.1.(e). Total mass is the sum of constituent mass and moisture mass. Moisture mass, in turn, depends on the specified moisture basis. Unless both percent constituent content and its associated moisture basis are known, the actual constituent concentration cannot be known with certainty. To correctly reflect that the constituent percent of total mass depends upon the specified moisture basis and to bring the code into agreement with the Publication 14 NIR Checklist, the NIR Sector agreed that paragraph S.1.1.(e) should be modified as shown in the recommendation above.

It was also noted during the review of the proposed changes to the Publication 14 NIR checklist that the checklist referenced paragraph UR.2.3 Printed Tickets. NIR printed tickets must record specific information such as constituent values and each constituent’s associated moisture basis. Publication 14 criteria should be based on specifications rather than user requirements. A review of the NIR code revealed that in cases where an analyzer converts constituent results to a manually entered moisture basis, there is nothing in the NIR Code specifications that requires the device to record the “native” constituent concentration and the native moisture basis along with the converted results and the manually entered moisture basis. There is also no specification that requires the printed information be arranged in a consistent and unambiguous manner.

Consequently, the NIR Sector proposed to amend paragraph S.1.1. (c) to include specifications for recording the “native” constituent value and moisture value along with the converted results and the manually entered moisture basis, to amend paragraph S.1.1.(e) to recognize the need for moisture basis in determining the constituent mass, and to add new paragraph S.1.1. (h) to include a specification that requires the printed information be arranged in a consistent and unambiguous manner.

During the 2003 Interim Meeting, the Committee heard no unfavorable comments on this item. Therefore, the Committee recommended the item for a vote at the 2003 NCWM Annual Meeting.

The Committee considered a proposal to define “nature moisture basis” as the default moisture basis of the sealable constituent calibration (the moisture basis of the device) since the term appears in the proposal, but is not defined in Handbook 44 Appendix D, Definitions. However, a new definition of the term “native moisture basis” is not needed since the term is already defined in paragraph A.3. Calibrations as follows: The "native" moisture basis is the default moisture basis of the sealable constituent calibration (or constituent calibration pair when a non-displayed moisture calibration is also involved).

357-2 VC S.1.2. Selecting Grain Class and Constituent

(This item was adopted.)

Source: Carryover Item 357-1B (This item originated from the National Type Evaluation Technical Committee (NTETC) Near Infrared Grain Analyzer (NIR) Sector and first appeared on the Committee's 2002 agenda.)

Recommendation: Modify paragraph S.1.2. as follows:

S.1.2. Selecting Grain Class and Constituent. – Provision shall be made for selecting, and recording the type or class of grain and the constituent(s) to be measured. The means to select the grain type or class and constituent(s) shall be readily visible and the type or class of grain and constituent(s) selected shall be clearly and definitely identified in letters (such as HRWW, HRSW, etc. or PROT, etc.). A symbol to identify the display of the type or class of grain and constituents(s) selected is permitted provided that it is clearly defined adjacent to the display. Minimum acceptable abbreviations are listed in Table S.1.2. Meters shall have the capability (i.e., display capacity) of indicating the grain type using a minimum of four characters in order to accommodate the abbreviations listed in Table S.1.2. If more than one calibration is included for a given grain type, the calibrations must be clearly distinguished from one another.
[Nonretroactive as of January 1, 200X]

Discussion: In 2002, the Committee indicated it was not appropriate to exempt specialty crops, an undefined commodity, from the entire NIR Code. The Committee agreed that it was more appropriate to address industry concerns about the proprietary nature of specialty crop calibrations by modifying paragraph S.1.2. The Committee proposed including language in paragraph S.1.2. that requires multiple calibrations (i.e., specialty crop calibrations) for a particular grain type to be clearly distinguished from one another.

In an attempt to arrive at a definition of "specialty crop," the NIR Sector considered one member's recommendation that a specialty crop might be one in which the constituents recognized by the NTEP Certificate of Conformance for that crop type (e.g., soybeans: protein, and oil) could not be measured accurately using the normal calibration because the specialty crop had a spectral response that differed significantly from the spectral response of normal varieties of that crop. High oleic soybeans (soybean varieties developed specifically to yield high concentrations of oleic acid) were cited as a good example of a specialty crop requiring special oil and protein calibrations. In contrast, "high oil" corn was not considered a good example of a specialty crop, although seed companies may market it as such. It was pointed out that although "normal" corn typically has an oil content in the 3 % to 4 % range, the GIPSA corn oil calibration contains low (3 % to 4 %), mid-range (5 % to 6 %), and high (>7 %) oil samples from three major seed companies. Sector members were in general agreement that it would be misleading to imply that this, or similar, "standard" calibrations are somehow unsuitable for use with high-oil corn samples. There was similar agreement that, from a regulatory point of view, it would not be desirable to allow the use of multiple calibrations (on the same device) for essentially the same commodity.

The NIR Sector searched for wording that would restrict the unnecessary use of multiple calibrations for the same basic grain type, but would still permit the use of proprietary calibrations where there was a legitimate need. The NIR Sector considered amending paragraph S.1.2. to include several variations of the statement "If a non-NTEP calibration is included for a given grain type, it must be clearly distinguished from other calibrations. The calibration description must clearly identify the unique end use property addressed by the calibration."

Ultimately, the NIR Sector decided on the wording in the recommendation above, which was originally proposed by the S&T Committee, adequately addresses requirements for specialty crops.

The Committee heard no unfavorable comments on this item. Therefore, the Committee recommended the item for a vote at the 2003 NCWM Annual Meeting.

358 Multiple Dimension Measuring Devices**358-1 I Tentative Status of the Multiple Dimension Measuring Devices Code**

Source: Carryover Item 358-1. (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Change the status of the Multiple Dimension Measuring Devices Code (MDMD) from tentative to permanent.

Discussion: In response to comments from weights and measures officials and industry representatives the Multiple Dimension Measuring Devices Code was considered for permanent status. The Committee also heard comments from industry that the code should be harmonized with the more stringent Canadian requirements. In January 2002, the Committee made the proposal a voting item. During the July 2002 NCWM Annual Meeting, industry representatives cautioned that other issues may exist because the code was developed prior to the introduction of some of the latest electronic technology. Therefore, the Committee changed the proposal's status from a voting item to an information item pending further review.

The Northeastern and Western Weights and Measures Associations recommended the proposal remain an information item until a work group could review the code requirements.

During the 2003 NCWM Interim Meeting, the Committee heard that there remained a number of proposals to modify Canadian requirements for MDMD devices. Consequently, in the interest of aligning U.S. and Canadian requirements, the Committee made the proposal an information item to allow time for review and comparison of U.S. and pending Canadian requirements.

The MDMD Work Group met July 17-18, 2003 to discuss outstanding issues in the MDMD Code. The Work Group plans to submit proposals for changes to NIST Handbook 44 MDMD Code by the January 2004 NCWM Interim Meeting.

For more background information, refer to the 2002 S&T Final Report.

360 Other Items

360-1 I Revise NIST Handbook 44

Source: Carryover Item 360-1 (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 1999 agenda.)

Discussion: The Committee is not aware of any updates on the work to revise NIST Handbook 44. The Committee recommends that all parties interested in learning the status of this project contact the NCWM Board of Directors (BOD).

At its 2002 Interim Meeting, members of the Northeastern and Western Weights and Measures Associations agreed to continue to support the BOD's effort and encourage them to fund this project.

The Committee also encourages the BOD to continue to provide financial support for the project. The Committee believes that the project to revise Handbook 44 is worthwhile and needed by its users.

The Committee believes that Handbook 44 is an important tool for the weight and measures community. The Committee agreed that work should continue to reformat the document to make it more user friendly. The Committee encourages the BOD to continue in its support of the project to revise Handbook 44.

360-2 I International Organization of Legal Metrology (OIML) Report

Many issues before the OIML, the Asian-Pacific Legal Metrology Forum (APLMF), and other international activities are within the purview of the S&T Committee. Additional information on OIML activities is available on the OIML web site at <http://www.oiml.org/>.

For more information on weighing devices, contact Steven Cook (NIST Weights and Measures Division Legal Metrology Devices Group (WMD-LMD)) by telephone at 301-975-4003 or by e-mail at steven.cook@nist.gov. For more information on grain moisture meters, contact Diane Lee (WMD-LMD) by telephone at 301-975-4405 or by e-mail at diane.lee@nist.gov. For more information on the R 117, "Measuring Systems for Liquids Other than Water" and R 105, "Direct Mass Flow Measuring Systems for Quantities of Liquids," and gas meters, contact Ralph Richter (WMD - International Legal Metrology Group (WMD-ILM)) by telephone at 301-975-4025 or by e-mail at ralph.richter@nist.gov. For more information on measuring devices, contact Wayne Stiefel (WMD-ILM) by telephone at 301-975-4011, or by e-mail at s.stiefel@nist.gov. For more information on electronic measuring devices, contact

Dr. Ambler Thompson (WMD-ILM) by telephone at 301-975-2333 or by e-mail at ambler@nist.gov. For more information on taximeters, contact Juana Williams (WMD-LMD) by telephone at 301-975-3989 or by e-mail at juana.williams@nist.gov. Each WMD representative can also be reached by postal mail at NIST, 100 Bureau Drive-Mail Stop 2600, Gaithersburg, MD 20899-2600 or by fax at 301-926-0647.

The NIST WMD contracted with Mr. John Elengo (Consultant) to create a line item comparison document and analysis of requirements in NIST Handbook 44 Scale Code and OIML Recommendations R 76, "Non-Automatic Weighing Instruments," and R 60 "Metrological Regulations for Load Cells." To obtain a copy of the document, access the WMD web site at www.nist.gov/own. The work represents the first stages to harmonize U.S. and international requirements for non-automatic weighing systems and load cells. The Committee requests comments on the draft document that compare R 76 and R 60 with corresponding requirements in NIST Handbook 44 Scales Code.

On Monday July 14, 2003 at the NCWM Annual Meeting open hearing session, NIST representatives Dr. Charles Ehrlich (WMD-ILM), Mr. Ralph Richter (WMD-ILM), Mr. Steven Cook (WMD-LMD) and Juana Williams (WMD-LMD) provided updates on OIML activities. For details on the entire OIML Report see Appendix A of the Board of Directors Final Report.

360-3 D Developing Items

The NCWM established a mechanism to disseminate information about emerging issues which have merit and are of national interest. Developing items have not received sufficient review by all parties affected by the proposals or may be insufficiently developed to warrant review by the Committee. The developing items are currently under review by at least one regional association or technical committee.

The developing items are listed in Appendix B according to the specific NIST Handbook 44 Code Section under which they fall:

- Part 1 – Scales
- Part 2 – Vehicle-Tank Meters
- Part 3 – Other Items

The status changes to developing items are as follows:

Old Reference Number	Title of Item	New Reference Number	Status Change
Appendix B Part 1, Item 1	N.1.3.4.1. Weight Carts	320-11	January 2003 upgrade of item to an Information Item
Appendix B Part 1, Item 2	T.N.3.X. Vehicle Scales Equipped Only With Weighbeam and Used to Weigh Aggregate	None	Committee withdrew this item from the developing agenda
Appendix B Part 2, Item 1	N.4.2. Special Tests (Except Milk-Measuring Systems), N.4.5. Product Depletion Test, and T.5. Product Depletion Test	331-6	January 2003 upgrade of item to an Information Item
Appendix B Part 3, Item 1	Update NCWM Publication 3, National Conference on Weights and Measures Policy, Interpretations, and Guidelines; Taximeters vs. Odometers Used for Transporting Fare Paying Passengers	360-4	January 2003 upgrade of item to a Voting Item

The Committee encourages interested parties to examine the proposals included in Appendix B and send their comments to the contact listed in each item.

The Committee asks that the regional weights and measures associations and NTETC Sectors continue their work to fully develop each proposal. If an association or Sector decide to discontinue work on a developing item, the Committee asks that it be notified.

360-4 V Update NCWM Publication 3, National Conference on Weights and Measures Policy, Interpretations, and Guidelines; Taximeters vs. Odometers Used for Transporting Fare Paying Passengers

(This item was adopted.)

Source: Southern Weights and Measures Association (SWMA). (This item first appeared on the Committee's 2001 Agenda as Developing Item 360-4, Appendix E. The item appeared in the 2003 NCWM Interim Agenda as Developing Item 360-3, Appendix D. During the 2003 Interim Meeting, the item status was changed to a voting item because there is a national consensus in favor of the proposed policy.)

Recommendation: Add the following interpretation to NCWM Publication 3, Section 3 – Specifications, Tolerances, and Device Inspection, Subsection 5 – Linear Measuring and Other Devices:

3.5.X Taximeters vs. Odometers Used for Transporting Fare Paying Passengers

Interpretation

Taximeters are required for use in transporting passengers and charging on a “distance traveled” basis. Vehicle odometers are not suitable equipment for such use. Odometers are suitable for use in charging “distance traveled” rates in rental vehicles in which customers pay on a “per-mile” basis for the right to operate the vehicle.

NIST Handbook 44 requires that devices must be suitable for their application with regard to their operating abilities, including their capacity, smallest division size, readability, performance, and design.

Handbook 44 General Code, which applies to all devices, requires in paragraph *G-UR. 3.3. Position of Equipment* that a device or system “*used in direct sales shall be so positioned that its indications may be accurately read and the weighing or measuring operation may be observed from some reasonable “customer and operator position.”* Reasonable customer positions in taxicabs or other vehicles in which a driver transports passengers includes all passenger seats in a vehicle, both front and back. A properly installed taximeter's indications are easily readable from any position in the vehicle, both in darkness and light. An odometer cannot be read accurately from most positions in a vehicle other than the drivers' seat.

Handbook 44 General Code also requires specific markings on devices including manufacturer's name or trademark, model designation, and a nonrepetitive serial number. All markings must be located so that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device. The code also requires electronic devices to have provisions for applying security seals that must be broken before any changes that affect the accuracy of the device can be made. While taximeters meet these requirements, most odometers do not.

Further supporting the requirement for taximeters over odometers are the tolerances for the two devices prescribed in Handbook 44. Transporting passengers for hire normally involves shorter distances at higher cost-per-distance charges than for rental vehicles. The tolerances for taximeters in the Taximeters Code are *1 % for overregistration* (error in favor of the cab) and *4 % for underregistration plus 100 feet* (in favor of the customer). The tolerances for odometers in the Odometers Code are *4 % for overregistration and underregistration*, allowing 4 times as much error in favor of the operator. As taxi fares are usually much higher than rental car costs on a per mile basis, this allows for unreasonable and unacceptable errors that could be financially injurious to the customer.

It should be noted that no taximeter is required in cases where the charges are based on zones or flat rates, providing that such methods are in compliance with local ordinances and are conspicuously posted and understandable to customers. When taximeters are used, the rates for distances traveled and any extras must be posted as well.

Background: The SWMA asked the NCWM to consider a proposal to modify NCWM Publication 3 “Policy, Interpretations, and Guidelines” to include an interpretation in Section 3, Subsection 5 specifying that odometers are not suitable equipment for use in transporting passengers and charging on a “distance traveled” basis.

The Committee concurred with the SWMA that the charging of passengers based on an odometer reading is inappropriate and does not comply with paragraph G-UR.1.1. Suitability of Equipment. The Committee recommends using paragraph G-UR.1.1. as a basis to prohibit odometers from being used to charge passengers for distance fares.

The policy in the recommendation above was developed by SWMA and assist weights and measures officials in requiring taximeters to be used in charging passengers on a distance traveled basis when hiring a vehicle and clarifies that the driver is to transport the passengers at a predetermined rate or rates.

The Committee recognizes that individuals or small taxi companies that operate in less populated or rural communities might obtain all necessary operating permits and licenses from the local government yet begin operations using vehicle odometers, rather than taximeters, as the basis for charging passengers. Local law enforcement agencies (e.g., local police or sheriff's departments) that are involved in the permitting process, but not the inspection of the measuring devices, see no problem in using odometers if they are accurate and demand something written specifically to address the issue before they will offer assistance in obtaining compliance. The Odometer Code and Taximeter Code does not directly address this suitability issue therefore, it must be explained through interpretations such as the one in this proposal. An NCWM endorsed interpretation would be of valuable assistance in obtaining compliance.

The Committee recognizes that NCWM Publication 3 has not been published or updated since 1991, although there have been many changes to Handbook 44 that justify additional interpretations and policies. Currently, weights and measures officials must rely on and reference the NCWM Standing Committee Final Reports for help in interpreting many provisions found in the codes. NIST Handbook 130 now contains the interpretations, policies, and guidelines related to Laws and Regulations issues, which are presumably kept up to date with each new edition unlike Handbook 44. The Committee acknowledges there is no plan for any working group, technical committee, or organization to publish the policy in a procedural document. However, the weights and measures community needs to reference policy that clearly specifies that odometers are not suitable for determining distance fares when transporting passengers.

The Committee has heard only comments in favor of this policy. Consequently, the Committee and the submitter of this proposal believes that the proposed policy is a good start to address the suitability issues that arise when odometers are used to charge passengers for distance fares. The Committee also encourages the SWMA and other weights and measures communities facing similar suitability issues to develop language for the Odometer and Taximeter Codes to further remedy this situation. The Committee recommended a change in the proposal's status from developing item to a voting item at the 2003 NCWM Annual Meeting.

Richard W. Wotthlie, Maryland, Chairman

Clark Cooney, Oregon

Jack Kane, Montana

Michael J. Sikula, New York

Craig Van Buren, Michigan

Ted Kingsbury, Canada, Technical Advisor

Richard Suiter, NIST, Technical Advisor

Juana Williams, NIST, Technical Advisor

Committee on Specifications and Tolerances

Appendix A

Prescription Scales – Counting Feature Test and Other Procedures (Item 320-2)

(The following information was excerpted from the 2003 Final Report of the S&T Committee for the Western Weights and Measures Association. The procedures included in this information are provided as background information on the proposal adopted by the 2003 NCWM to recognize the counting feature on Class I and Class II Prescription Scales. The procedures have not been evaluated to determine if they are appropriate for verification of the counting feature. The Committee did not modify the format of the procedures to correspond to existing handbook test notes, type evaluation checklists criteria, or examination procedure outlines (EPO). The Committee developed a test procedure for the field verification of the counting feature (see Item 320-2).

I - Calculating Piece Weight

How to Perform Piece Counting with Reference Weight Calculated by the Prescription Scale

1. Zero the scale
2. Place reference (appropriate sample) number of pieces on scale pan.
3. Input reference quantity data into Prescription scale
4. Prescription scale waits for the weight to become stable
5. Prescription scale calculates reference weight (reference weight = current weight on scale divided by selected reference quantity)
6. Scale stores the calculated reference weight and reference quantity
7. Scale switches to a count display with the current quantity displayed
8. Scale is now ready to continue counting – indicated number of pieces = current weight divided by reference weight

Reference Weight Optimizing Program

(Optional algorithm for counting feature described above)

When you place a number of pieces on the pan, which is at least three pieces higher than the reference count of pieces, the new reference weight is being recalculated and stored together with this higher reference count. The prescription scale could confirm this by some type of symbol located on the display.

	Weight [g]	Calculation [pieces]	Display [pieces]	Reference-weight [g/pieces]	Reference-count [pieces]	New Reference Weight
Start	5.123	5	5	1.024 6	5	Yes
1. count	25.500	24.888	25	1.020 0	25	Yes
2. count	26.450	25.931	26	1.020 0	25	No
3. count	50.700	49.706	50	1.014 0	50	Yes
4. count	30.050	29.635	30	1.014 0	50	No

II – Specifications for Prescription Scales Equipped with a Counting Feature

Recommended Prescription Scale Characteristics

- The scales should be Accuracy Class I or II
- Counting mode must be evident on display
- Scale display must be able to differentiate between counting and weighing
- Scale capacity would range from 310 g to 620 g
- Suggested scale divisions of $d=0.001$ g, $e=0.01$ g
- Scale is equipped with a zero count indicator
- Scale is equipped with zero-count setting capability
- Verification resolution 0.010 g

- Linearity ± 0.0015 g
- Reproducibility ± 0.001 g

III - Test Methods to Determine the Prescription Scale's Performance

Scope

The following guidelines are proposed for testing potential prescription scale equipped with a counting feature to ensure counting accuracy. These procedures describe the tests to be used in determining various parameters of a prescription counting scale.

The prescription counting scale test procedures determine:

- a) The precision of determining mean piece weight,
- b) The minimum and maximum mean piece weights,
- c) The minimum weight and minimum piece count that may be used to determine mean piece weight,
- d) The linearity in determining accurate mean piece weight throughout the prescription scale weight range,
- e) The linearity and accuracy of determining mean piece weight given a range of pill quantities,
- f) The percent of a pill required for indicating the next pill quantity.

Recommended Method for Determining Prescription Scale Accuracy During Counting Function

The following test plan should be carried out to approximate most of these values. The resolution and accuracy internal to the device cannot be determined; however, these tests may identify significance or a means to approximate the internal resolution.

Assumptions

- a. Tests must be performed in a laboratory setting to minimize external influences. An assumption must be made that the scales are Class I or II balances and testing must be performed under suitable Class I scale conditions that is, free from temperature fluctuations, vibration, draft, calibration, warm-up, level, and free from static or other electro-magnetic sources. Use ASTM E 617 Class 2 (OIML R 111 Class F1) or better calibrated weights, proper weight handling conditions, and ensure weight cleanliness.
- b. Tests will be performed on at least two of each scale device. Testing on a third device will be required should significant variations be noted on any one scale of the same class.
- c. Class 2 or better (Class 1 preferred during calibration) test weights will be used during testing. Clean and air dry all test weights using an approved method. If unable to determine Class the appropriate 1/2 weight cleaning procedure, assume that the use of denatured alcohol is an approved solvent for cleaning that will result in no residue on weights.
- d. Perform all tests using the same test weight set.
- e. Preference is for the same operator and same environmental setting be used to perform all like tests. Preference is for all like devices to be tested at the same time or as close as possible.
- f. Each test defined below should be performed without interruption in time or concentration. After the test is performed, the same test should be repeated on the second device immediately thereafter. If necessary, a third device should be tested. This is to ensure repeatability under the same or similar conditions.
- g. All tests will be performed a minimum of 5 times or as stated in NTEP testing procedures if an equivalent test exists.
- h. All test results must be recorded when performed. All exceptions, retries or retesting, significant pauses in testing and aborted tests or scale recalibrations must be noted before, during and after test. Time should be recorded at the beginning and completion of each major test.
- i. Once testing begins, **absolutely no recalibration** of the scale may occur throughout the **entire** test sequence. (Should recalibration be needed during the testing; the entire testing must be aborted and properly documented and testing restarted at the beginning.)
 1. Calibrate scale using approximately two-thirds total load of scale
 2. Verify scale calibration conforms to Class I or II (NIST Handbook 44 Table 6)
 - i. Verify by approaching calibration weight from below and above as defined in NTEP testing procedures.
 3. Verify linearity across entire range (per NTEP)
 4. Verify corner load (per NTEP)

5. Verify calibration every hour while testing. If greater than ± 0.001 g error; calibration error must be sufficiently explained before resumption of testing. All tests to last known good calibration must be repeated; with original test results also noted.
6. Record all results.
- j. Record all results within a spreadsheet. Use formulas wherever possible. Record all significant digits. Display in fixed format. Display all calculated values to 6 significant digits. Note any formula or calculation that uses a rounded or truncated value. Test results sheets should also contain other good laboratory practices background data. (e.g., Time, date, who, SN,)
- k. Before starting the tests defined below, perform the following NTEP tests. These tests must be performed daily before testing starts. Use a single test weight nearest the two-thirds total load. (or larger if required)
 1. Verify calibration using approximately two-thirds total load of scale.
 2. Verify return to zero after each test above. Tare as needed. Do not continue testing if repeatability of zero is unreliable (e.g., must repeatedly tare for zero values greater than ± 0.001 g.)
 3. Verify linearity across entire range (per NTEP) accuracy and repeatability.
 4. Verify corner load (per NTEP). For each test, Record the actual test weight, displayed value, note fluctuations in display as comments. Calculate error, percent error in spreadsheet
 5. Record all results.
 6. Steps 1 and 2 must be performed at the beginning and completion of each test phase to insure test reliability.
- l. If a test range of values requested for N are not specified, where N is the Assume 5, 10, 30, 100, 200 or some N to match test weight specified) these represent minimum scale reference quantities and typical in-use values for reference quantities. The maximum N may need to be determined based on the test being performed and the test weight specified.
- m. If a test range of values request for test weights is not specified. Assume 0.020 g, 0.030 g, 0.300 g, 0.400 g, 1.000 g and 10.000 g. These values represent the smallest drug weights, average and median drug weights and upper end and maximum drug weights)
 1. Scale communication interface minimum piece weight. All tests for this section assume communication with the scale CPU from a computer or via the RS-232 interface. The recorded value should be to the highest resolution accepted by the scale. (Repeat once)
 - i. What is the highest resolution value accepted by the scale? (00.123 45...9... g)
 - ii. What is the minimum acceptable piece weight accepted by the scale via the RS-232 interface? (in xx.xxxxx grams format)
 - iii. What is the maximum acceptable piece weight accepted by the scale via the RS-232 interface?
 - iv. What is the highest resolution value returned by the scale?
 - v. What is the resolution recorded in the library? (00.123 4 g)
 2. Scale calculated minimum piece weight. All tests for this section assume the scale is performing the piece weight calculation. (e.g., An operator places N pieces on the scale and the scale calculates by total weight / N = piece weight.) Determine by using the same reference weight(s) and adjusting N. (Note: Reference weight must be greater than scale minimum weight. Preferably 2x to 5x minimum scale weight.) (Repeat once)
 - i. What is the maximum resolution piece weight value returned by the scale?
 - ii. What is the minimum number of reference pieces accepted for determining reference weight?
 - iii. What is the minimum piece weight that will be calculated by the scale?
 - 1) Does this vary by the number of pieces? (i.e., Changes in N)
 - iv. What is the minimum total weight that the scale will calculate a piece weight?
 - 1) Does this vary by the number of pieces? (i.e., Changes in N)
 - v. Record the following
 - 1) Actual weight used
 - 2) Reference quantity set (N)
 - 3) Scales calculated reference piece weight (ActPcWt)
 - 4) Theoretical reference piece weight (TPcWt)
 - 5) Error (TPcWt – ActPcWt)
 - 6) Percent error = $(TPcWt - ActPcWt) / TPcWt * 100$
 3. Scale accuracy in determining piece weight. These tests are to determine the scales algorithm in piece weight calculation. Testing assumes use of test weights as a quantity. Where practical, use nearest whole test weight. Otherwise use as few weights as possible.
 - i. What is the accuracy of the scale determining piece weight?
 - ii. Does the accuracy change by changes in N?

- iii. Repeat for N = 5, 10, 30, 60, 100 and 200 using a 5.000g test weight.
- iv. Does the accuracy change by changes in total weight?
- v. Repeat for approximate piece weight (after scale calculation) to be near 0.020 g, 0.030 g, 0.300 g, 0.400 g, 1.000 g, and 10.0 g with a count in the 60 to 180 range. (i.e., 2.000 g, 5.000 g, 20.000 g, 50.000 g, 100.000 g, and 200.000 g test weights)
- vi. Use single reference weight nearest 25 % of total load capacity.
 - a) Adjust N as required to achieve average pill pc.weight (0.300 g – 0.400 g). (Example 310.000 g * 0.25; locate nearest single reference weight. Nearest Single Reference Weight / 0.300 = N)
 - b) Repeat for 50 % and 90 % of total load capacity by estimating N and then immediately finding N
 - c) Record the following
 - i) Actual weight used
 - ii) Reference quantity set (N)
 - iii) Scales calculated reference piece weight (ActPcWt)
 - iv) Theoretical reference piece weight (TPcWt)
 - v) Error (TPcWt – ActPcWt)
 - vi) Percent error = $(TPcWt - ActPcWt) / TPcWt * 100$
4. Next pill tests. These tests are to determine the counting algorithm used within the devices
 - i. What percent of a piece weight is required to generate the next count? (i.e. N+1)
 - ii. Does this vary by piece weight value?
 - iii. Does this vary by count?
 - iv. Does this vary by scale settings?
 - v. Perform tests at approximately 25, 50, 75 and 90 % of total load
 - vi. Choose nearest whole weight (W1)
 - vii. Perform test with N = 30 and 100
 - viii. Scale to calculate reference piece weight
 - ix. Place test weight on scale
 - x. Extract and Record scales reference piece weight. (PcWt)
 - xi. Record calculated piece weight. (W1 / N)
 - xii. Add test weight(s) in 0.001 g increments (or using binary search procedure) until N+1 value is reached.
 - xiii. Record total weight (and individual test weights) to nearest 0.001 g (W2) (proper protocol must be followed in approaching the N+1 count. Follow NTEP test procedures for slowly adding test weights in a reliable, predictable fashion. If the >0.001 g added and N+1 event occurs, sufficient test weights must be removed to reliably predict weight required for N+1 threshold. Do not drop weight onto scale pan. Do not touch scale pan when placing weight on scale. Do not touch scale pan when removing weight. Do not press on scale pan when removing weight.)
 - xiv. Add test weight(s) in 0.001 g increments (or using binary search procedure) until N+2 value is reached. (W3)
 - xv. Record total weight (and specify individual test weights used) to nearest 0.001 g
 - xvi. Calculate and Record percent of piece weight required
 - a) $(W2 - W1) / PcWt * 100 \%$
 - b) $((W3 - ((W3 - W2) / 2)) / PcWt * 100 \%$
 - c) Note: both values calculated in i) and ii) above should be identical
 - d) $(W3 - W2) = PcWt \quad ???$
 - xvii. Once weights required for N+2 and N+1 are known; start with weight for N+2 + (PcWt / 2)
 - a) Remove weights in 0.001 g increments (or using binary search) until N+1 threshold reached.
 - b) Record total weight (W4)
 - c) Remove weights in 0.001 g increment until N reached
 - d) Record total weight (W5)
 - xviii. Calculate and record percent of pieces required
 - a) $W4 - W3 =$ difference for N+2 event
 - b) $W5 - W2 =$ difference for N+1 event
 - c) $W5 - W4 = PcWt \quad ???$
5. Counting accuracy based on known piece weight. These tests are to determine the linearity and accuracy of counting by using known weights and programmed piece weights.
 - i. Perform tests with piece weight set to 0.020 g, 0.030 g, and 0.050 1 g
 - ii. Test at 20x, 50x, 100x, 150x, 200x counts.
 - iii. Record
 - a) Actual total weight required

- b) Specific test weight(s) used,
- c) N
- d) Expected total weight,
- e) Error in weight
- f) Percent error
- iv. For 0.0501 g piece weight, test using 100.000 g weight (W1)
 - a) Set piece weight to 0.0501 g
 - b) Place the 100.000 g weight on scale
 - c) Record count (N)
 - d) Add weight(s) in 0.001 g increments until N+1 count reached (W2)
 - e) Record
 - 1) Actual total weight added,
 - 2) Specific test weight(s) used,
 - 3) Error in weight
 - 4) Percent error ((calculated weight needed for N+1 – actual weight) / calculated weight needed for N+1)
 - f) Continue adding weight in 0.001 g increments until N+2 count reached (W3)
 - g) Record
 - 1) Actual total weight added,
 - 2) specific test weight(s) used,
 - 3) Error in weight
 - 4) Percent error ((calculated weight needed for N+1 – actual weight) / calculated weight needed for N+1)
 - h) Calculate the following
 - 1) $W4 = W2 + (W3 - W2) / 2$ (represents N+1)
 - i) Repeat test above using 200.000 g weight

IV - Test Methods to Determine the Performance of the Counting Feature

Verifying Accuracy of a Counting Scale

A counting scale calibration assumes the following parameters are available when operating in the piece counting mode.

D(i)	Internal scale resolution used during counting. D(i) will be higher resolution than e and d parameters currently on the weighing scale.
PcWt(min)	Minimum mean article weight. PcWt(min) should follow normal distribution curves.
Class (count)	Counting accuracy class. Class (count) determines the percent accuracy of the counting feature. Ideally, Class (count) should mimic the weighing Class I, II, III.

In addition, these parameters may be needed internal to a counting scale:

PCs (min)	Minimum number of pieces allowed to establish PcWt. The PCs (min) is determined by the article type being counted. To some degree, the PCs (min) are established by the Normal Distribution of the article being counted.
CNT (min)	$PcWt (min) / D(i) =$ minimum number of scale intervals (D(i)) between each article counted.

Because article counting depends directly on the weight capacity, resolution, and mathematical routines internal to an electronic digital scale, no absolute counting calibration should be necessary or possible. The counting scale will support a method of establishing an article reference weight by either calculation based on an expected quantity or by direct entry (either manually or via a computer interface). However, a means must be provided to verify counting calibration based on an article reference weight.

Counting Scale – Verification of Counting

Two alternative methods will be available to the scale manufacturer to demonstrate counting accuracy.

- Method #1 - Using a first test weight and a selected quantity to establish the article reference weight. And a second test weight to verify the count accuracy within the Class (count) tolerance.
- Method #2 - Counting scale retrieves a known (and published) article reference weight and a test weight to verify the count accuracy within the Class (count) tolerance.

Both methods assume the scale weighing calibration has been performed and the article reference weight (determined or pre-programmed) is typical for the intended application. The article reference weight must also be selected to result in the use of test weights typical for the Class of scale being used. The test weight value should be an even multiple of the article reference weight to simplify verification by using a singular test weight.

Method #1 – Using a Reference Quantity to Verify Counting Accuracy

This method assumes a known (published) reference quantity and a test weight will be used to establish the article reference weight and then this established article reference weight is used to verify the count accuracy to within the specified Class (count) accuracy.

The advantage to this method is that any test weight set for the Class scale may be used to verify proper operation of the counting scale. The operator selects two test weights that are X and 10X to 100X values within the published scale weighing range and greater than the PcWt(min).

The counting scale may support multiple quantities for the operator to select from in establishing the individual reference weight value. These quantities allow the scale to calculate an article reference weight based on a theoretical sample size of N articles.

Determining the Test Weights Needed:

1. Determine the article quantity to be used for establishing the reference weight. (N)
2. Calculate a test weight #1 (TW1) that is above the PcWt(min) and typical for the articles counted. (Example: $PcWt(min) * N < \text{test weight \#1 (TW1)}$)
3. Calculate a test weight #2 (TW2) that is 10X to 100X the test weight #1.

Establishing the Article Weight:

4. Place the scale in the counting mode.
5. Place the scale in the mode used to establish article reference weights for the quantity of articles (N).
6. Following the scale manufacturer's direction, place the TW1 on the scale to establish the article reference weight. ($Ref.Weight = TW1 / N$)
7. Wait for the scale to indicate that the article reference weight calculation is complete.
8. Verify the quantity displayed.

Verify the Counting Accuracy Using the Established Article Reference Weight:

9. Zero the count display.
10. Place test weight #2 (TW2) on the counting scale.
11. Verify the quantity display is 10 to 100 articles (as previously calculated) are within the Class (count) tolerance.

A scale manufacturer may choose to publish the calculated article reference weight, N, TW1, TW2 and tolerance range values and procedures to simplify the verification task. A table of calculated article reference weights, N, TW1, TW2 and tolerance range values may be published for scales with multiple weighing ranges (and therefore counting ranges and corresponding tolerances).

Calculated article reference weight	N	Test Weight #1 (TW1)	Test Weight #2 \pm (TW2)	Expected Count and acceptable Tolerance
0.020	10	0.200 gram	20.000 gram	$100 \pm x$
0.100	10	1.000 gram	100.000 gram	$100 \pm x$
0.100	10	1.000 gram	300.000 gram	$300 \pm y$
0.300	10	3.000 gram	300.000 gram	$100 \pm x$

Method #2 – Using a Reference Article Weight to Verify Counting Accuracy

This method assumes a pre-programmed, known and published article reference weight will be used to verify the count accuracy to within the specified Class (count) accuracy. The pre-programmed article reference weight should be typical for the articles being counted. The operator may be able to select from a list of article reference weights or program a specific article reference weight.

Determining the Test Weight Needed

1. Calculate the test weight needed to be in the 10X to 100X range of the article reference weight. Pre-programmed article reference weight * 100 = test weight #1 (TW1).

Verify the Counting Accuracy Using the Established Article Reference Weight

2. Zero the count display.
3. Place test weight #1 (TW1) on the counting scale.
4. Verify the quantity display is 10 to 100 articles (as previously calculated) are within the Class (count) tolerance.

A scale manufacturer may choose to publish the article reference weight, TW1 and tolerance range values and procedures to simplify the verification task. A table of article reference weights, TW1 and tolerance range values may be published for scales with multiple weighing ranges (and therefore counting ranges and corresponding tolerances).

Article Reference weight	Test Weight #1 (TW1)	Expected Count and acceptable Tolerance
0.020	20.000 gram	$100 \pm x$
0.100	100.000 gram	$100 \pm x$
0.100	300.000 gram	$300 \pm y$
0.300	300.000 gram	$100 \pm x$

Appendix B

Developing Items (Item 360-3)

Part 1, Developing Items - Scales

Part 1, Item 1 N.1.3.4.X. Weight Carts

Discussion: The status of this proposal was changed to an information item and now appears as Item 320-11.

Part 1, Item 2 T.N.3.X. Vehicle Scales Equipped Only With Weighbeam and Used to Weigh Aggregate

Source: Central Weights and Measures Association (CWMA)

Recommendation: Add new paragraph T.N.3.X. to the Scales Code as follows:

T.N.3.X. Vehicle Scales Equipped Only With Weighbeam and Used to Weigh Aggregate. - The minimum tolerance applied to vehicle scales equipped only with a weighbeam and used solely to weigh aggregate products shall be 100 lb.

Discussion: The CWMA requested input on this proposal to increase the tolerances for vehicle scales equipped with only a weighbeam and used to weigh aggregate.

The Committee heard numerous comments that the proposal has no technical merit and the scale tolerances should not be modified to accommodate equipment that is not able to maintain NIST Handbook 44 tolerances and other technical requirements. Consequently the Committee recommends the CWMA withdraw this item from its agenda.

The Committee recognizes the economic challenges faced by industry. The Committee believes the existing tolerances were not intended to be burdensome to either the scale user or customer that purchases a commodity that is weighed on the scale. The Committee can find no technical justification for modifying current Handbook 44 tolerances. Therefore, the Committee is withdrawing this item.

Part 2, Developing Items – Vehicle-Tank Meters

Part 2, Item 1 N.4.2. Special Tests (Except Milk-Measuring Systems), N.4.5. Product Depletion Test, and T.5. Product Depletion Test

Discussion: The status of this proposal was changed to an information item and now appears as Item 331-6.

Part 3, Developing Items – Other Items

Part 3, Item 1 Update NCWM Publication 3, National Conference on Weights and Measures Policy, Interpretations, and Guidelines; Taximeters vs. Odometers Used for Transporting Fare Paying Passengers

Discussion: The status of this proposal was changed to a voting item and now appears as Item 360-4.